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July 10, 1930

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Engineering News-Record

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Careful Finishing Gives An Unusually Smooth Pavement

Operating Procedure in Vending Truck-Mixed Concrete

A Survey of Earthquake Damage to Buildings in Tokyo

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A Consolidation of Engineering News, Engineering Record, The Sanitary Engineer, and The Contractor

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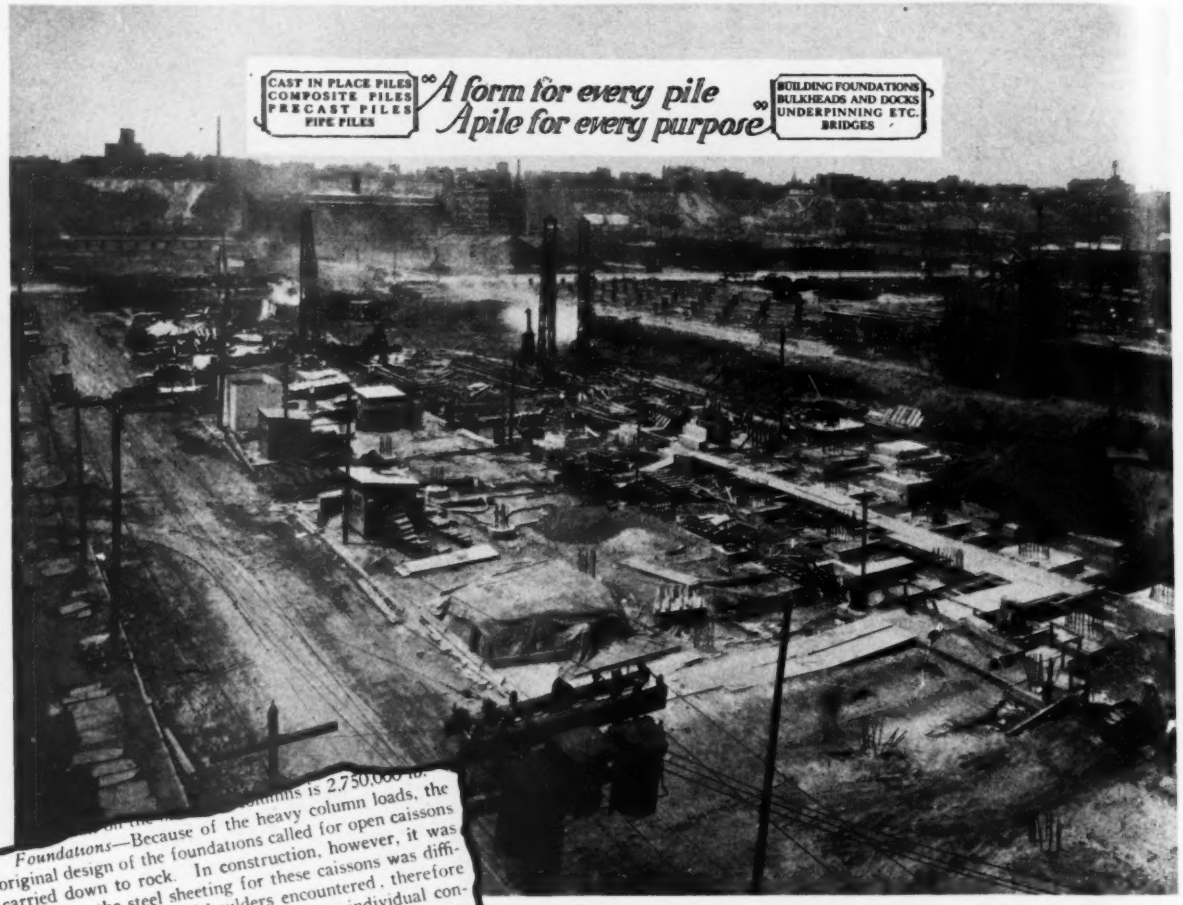

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Foundations—Because of the heavy column loads, the original design of the foundations called for open caissons carried down to rock. In construction, however, it was found that the steel sheeting for these caissons was difficult to drive because of boulders encountered, therefore the type of foundations was changed to individual concrete footings on concrete piles surmounted by a continuous reinforced-concrete mat over the whole area to form the basement floor. Piles for the main footings were cut off at El. —9.42, the top of the basement floor being El. —3.5. To avoid expensive excavation that would have been necessary by carrying the entire footing and pedestal below the floor surface, the pedestals were permitted to protrude above the basement floor level to provide for the tremendous punching shear resulting from the heavy column concentrations. All the foundations are reinforced in both directions, except the combined footings between the pairs of elevator shafts, which required a special design

The Turner Construction Co., New York, is general contractor on the viaducts, bridges and warehouse. The Raymond Concrete Pile Co. was subcontractor on the foundation work. The concrete crib retaining walls, grading and trackwork are being handled by railroad forces.

By M. Hirschthal
Concrete Engineer, Delaware, Lackawanna & Western R.R. Hoboken, N. J.

—from Engineering News-Record March 27, 1930

RAYMOND—a

These figures tell the story

D. L. & W. WAREHOUSE, JERSEY CITY, N. J.

Total Number of Piles—14,908 Footage—342,095

Approximately Sixty-Five Miles of Piles

Largest Raymond Pile, 37-ft. 7-in.—Shortest, 7-ft. 8-in. Average 23-ft.
12,000 Yards of Concrete.
Contract Closed 12-12-28—Completed 8-20-29
Total 439 Rig Working Days (Six Weeks Delay Due to Strike)
Average 34 Piles per Rig per Driving Day (5 Rigs on Job)
Approximately 4,200 Piles Driven During May
Maximum Number of Piles per 1 Rig 1 Shift (8 Hours) 98

GENERAL CONTRACTOR—
TURNER CONSTRUCTION COMPANY

Officials of D. L. & W. R. R. in Charge:

G. J. Ray, Chief Engineer — **M. H. Doughty, Ass't Engineer**
J. L. Vogel, Bridge Engineer — **H. Hirschthal, Concrete Engineer**
Walter Lozier, Res. Engineer — **Supt. for Raymond: J. L. Nalen**
Project Manager: H. A. Christie

ENGINEERING NEWS-RECORD

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DEVOTED TO CIVIL ENGINEERING AND CONTRACTING

F. E. SCHMITT, *Editor*

Volume 105 NEW YORK, JULY 10, 1930 Number 2

Subways for Chicago

WITH kaleidoscopic suddenness the long-stationary transit scene in Chicago has shifted, and a subway-building program born almost overnight is moving forward to the construction stage. Under the new transit unification ordinance approved by popular referendum ten days ago the city's accumulated fund for subway construction is released for immediate use, subject to the ability of financial wizards to convert the city's tax anticipation warrants into gold—a difficult but now not impossible transmutation. Accordingly the famous clay subsoil of Chicago is to be pierced by miles of subway structure, and this work is likely to bring out innovations in design that will make it noteworthy in American rapid-transit subway history. Precedents set by the rock and sand soils and cramped street conditions of New York will probably not control. But apart from construction detail, the creation of a new rapid-transit trunk is sure to influence the city's growth profoundly and bring thousands of acres of dead district to a new life.

Boulder Dam Work Begins

A LONG, hard campaign reached its successful end this week, when within the space of a few days Congress passed the Boulder Canyon initial appropriation, the President approved it, and field work on construction began. The great significance of the event is fairly reflected by the swirl of debates, hearings, negotiations and intrigues that has eddied around the project for nearly ten years. A stream of vast destructive force and of equally vast potentiality for useful service will be regulated at Black Canyon. That the dam will be almost twice as high as any yet built, and constitutes as picturesquely difficult an engineering problem as may be found in this field of human craft, and that the reservoir will be of unprecedented capacity, are merely incidental features. The dominating elements of the project are the final control of the flood-and-silt instability in the remarkable delta region of the Colorado River, the conservation of its now largely wasted volumes of water for the benefit of the entire Southwest, and the initial extraction of its great stores of power, whose ultimate meaning for the region of the Great Basin is likely to surpass all present conceptions. Such great objectives were worth the long fight. The nation has entered on one of the most constructive enterprises in its history.

A Bad Start

THE ORIGINAL Federal Power Commission fell into disrepute because it was so constituted that the authority nominally vested in the three cabinet officers who made up the commission was largely exercised by their subordinates, to the dissatisfaction of the general public. Due to the growth of this dissatisfaction, Congress recently authorized the setting up of a new, full-time commission to take over the administration of the federal power act. It was hoped that the appointments to the new commission would be such as to restore general confidence in its makeup and assure its recognition as an unprejudiced body, free from arbitrary tendencies. The President's first appointment, that of Lieut.-Gen. Edgar Jadwin to the chairmanship of the commission, is a sharp disappointment of these hopes. General Jadwin, able engineer though he may be, was the center of a long and heated controversy over flood control on the Mississippi River. His arbitrary methods and his arrogant disregard of the views of others made many enemies; and at times he seemed to have contempt even for the expressed purpose of Congress under which he was acting. Right or wrong, such methods are not compatible with effective administrative progress under our system of government. This is a critical time in the history of federal control of power in this country. The new commission has a task before it in which it needs the confidence and support of the whole country if it is to succeed. Automatically it loses that confidence on the part of a large number of the engineers with whom it must deal because of this lack of confidence in General Jadwin.

Ship Against Bridge

WITH each new project for a large bridge the old contest of ship against bridge is renewed and demands of the ship for great clearance heights become more extreme. The project for a Hudson River bridge at Fifty-seventh Street, New York, and the Golden Gate bridge project at San Francisco, are the latest instances, following the Longview bridge case, in which the government authorities imposed a minimum clearance height of 195 ft. At New York a height of 200 ft. has been demanded by the War Department; at the Golden Gate the ship men ask for 250 ft. In part these demands merely mask opposition to any bridge whatever, but in part they represent beliefs that ships if given free scope will grow—like skyscrapers—beyond all present limits. Whether it is proper to encourage such unbounded growth, or whether bridges should be forced up to dizzy heights on idle future speculation, has never had conscientious consideration. If ship lock dimensions and railroad clearance diagrams were treated in such loose manner, much of the world's commerce would stop. There is evidence that the needs of the largest ships are far below the limits above mentioned, and that the extreme funnel or mast heights of a few vessels represent architectural fancy rather than service need. Some of the newest and greatest passenger vessels have lower funnels than smaller vessels of earlier date. Francis Lee Stuart showed recently, at the Fifty-seventh Street bridge hearing, that 150 ft. or even less represents the highest service necessity that can fairly be reasoned out of ship-construction conditions. Figures of this kind carry the clear implication that some of the recent shipping demands are fantastic and lack merit. They suggest also that a genuine inquiry into the height requirements of

ships by a balanced tribunal of authorities would be timely. Unreasonable obstruction to bridge building benefits no one.

Ready-Mixed Concrete Control

QUALITY control of transit-mixed concrete has been a dubious factor of this rapidly increasing business. It is of particular interest therefore to note the methods employed and the degree of care exercised in checking results by a director of one of the most modern concrete-vending plants, as described in this issue. There are three fundamental elements of the control procedure. The first, naturally, is a plant equipment of all reasonable devices for precise proportioning and grading of materials and the plant practice of regular tests of the product. The second element is educational supervision first of the truck drivers, who are the mixer operators, and second of the users, these latter with a view to guarding against abuse of the delivered concrete by retempering or otherwise. The third element is supervision by the city building department, which, although it is least emphasized in the article, is likely to possess the greatest future significance. With concrete being generally vended for building construction, a large percentage of which is under no adequate engineering control, building departments will be required to organize so as to have effective control of the vended product. It is not too soon for building department officials to give consideration to adequate ways and means of procedure.

Uniform Lien Laws

AGREEMENT a short time ago on a standard state mechanics lien act by the drafting committee appointed in 1924 by Herbert Hoover, then secretary of commerce, brings to a conclusion a contest which has been bitterly fought for half a decade to secure fair dealing for owners in lien actions. There was distinct need for the work of the standardizing committee. Legislation giving the power of lien, conceived at the beginning only as a means of guarding the workman against loss of his labor, has in the passing years been extended to protect purveyors of about every kind of product employed in construction. State lien laws, built up by yearly accretions, grew differently, and ultimately there was no uniformity through the country in the powers to exercise lien or in the interests which received lien privileges. The situation was acknowledgedly vicious and all construction interests cried for its improvement. The standard state mechanics lien act committee was the agency conceived of to initiate improvement by drafting a uniform law. Almost from the first there was a division of purpose in the committee, and finally a spirited contest that developed into a determined effort to provide power of lien without notice to the owner. Stubborn resistance was offered to this effort by the engineer and contractor members of the committee. It serves no purpose now to review the dispute. In the end the right of the owner to receive notice that lien on him would be exercised was drafted into the act, and his interests were conserved in other minor respects. Thus the uniform law has been made an acceptable document, provided one concedes the principle which practice has established, that lien privileges are justified not alone as a protection to powerless creditors but as an automatic guarantee of payment to all creditors, however carelessly they may extend their credit or however powerful they may be to guard their rights. The standard lien law now stands approved by the drafting committee, but it has yet to go before the subcommittee and then the full body of the Conference of Commissioners on Uniform Laws for approval and submission to the states. Despite its broad range it is far superior in its justice to all interests than are any but a few of existing mechanics-lien acts. Its general adoption, therefore, will be a gain to construction.

Sidewalks for Highways

THERE has been talk of sidewalks for highways ever since the motor vehicle became the chief user of the public roads. Usually the agitation has been local and has become stilled after a few editorial outbursts in the town newspaper. Popular demand for these conveniences never became wide enough to bring about their serious consideration as a construction policy by state and county highway officials. Cramped for funds with which to build main roads as rapidly as the traffic demands, these public servants have felt that sidewalk additions were economically uncalled for except in rare situations. Their decision has not been challenged by any considerable amount of active public sentiment. There are now signs that a change is coming which highway officials will be compelled to consider.

Acts were passed in both New York and New Jersey by the last legislatures which empower public roads officials to build sidewalks. In New York the initiative lies with the town, upon whose petition the county may prepare definite plans and estimates; if these are approved by the state superintendent of public works, the county may proceed with construction, charging back to the town 35 per cent of the cost. The New Jersey act empowers the state highway commission to build sidewalks at its own charge or by agreement with municipalities upon some basis of cost sharing. Agitation to secure corresponding legislation in all states is now being conducted by the American Society of Municipal Improvements, which reports increasing interest in the movement.

Properly restrained as in the New York and New Jersey laws, premature action in establishing sidewalks as standard highway equipment seems hardly to be feared. There are too many problems in main road construction which yet hold precedence to warrant any encouragement of unrestrained rural highway sidewalk building. On the other hand sidewalks are so obviously a part of roadside development that any serious undertaking to encourage constructive thinking on the subjects of their financing and construction is to be welcomed.

Progress in Prequalification

PREQUALIFICATION of contractors for state highway construction has been made a law in South Carolina. This is the second state to make specific statutory provision for prequalification, California having preceded the southern state by six months in giving its public-works officials authority to fix eligibility requirements for contractors seeking to construct state highways. Judged only by these accomplishments, as against the fact that other states have refused to enact similar legislation, the progress of prequalification appears slow.

Legislative action, however, represents only a fraction of the advance. If the adoption of prequalification did not extend well beyond its specific requirement by statute, the situation would indeed be discouraging. As actual fact, half a dozen states, without definite law, require prequalification; numerous municipalities have adopted it,

and the federal bureau of public roads employs it on all contracts awarded directly by the bureau. A canvass of these engineers shows unanimous agreement that it has decreased defaults and increased the percentage of work completed on time and has encouraged competition of the desired kind.

Encouragement and understanding of prequalification are still largely lacking among engineers. Their association work, except the recent action of the Association of State Highway Officials, does not evidence even academic interest. It has been the contractors' associations so far that have had to wage the battle for predetermined competency of bidders and to carry conviction of its importance into engineers' associations. The task has been a tedious one, but it very definitely needs to be continued.

There is even greater need of educational work within the contracting fraternity itself. Many contractors are by no means convinced that the freedom legitimately to build up a contracting business is not curtailed, or that unlimited authority placed in the hands of an agency for determining fitness will not be misused. Altogether, prequalification is not axiomatically an unmixed blessing. Failure to consider this fact has been the error of most propaganda for the practice. It should be corrected in future promotional work, by making it plain that the way in which prequalification is applied determines its justice and by laying down the fundamental principle that required qualifications must be definitely stated. There is a decidedly unengineering and unbusinesslike lack of definition in most of the current argument for and against prequalification of contractors.

Advances in Sludge Handling

REMOVAL of sludge from sewage settling tanks has made great advances since the early days. Then hand removal, with more or less aid from water under pressure, gave way to removal by hydrostatic pressure from the settled sewage above the sludge. This necessitated either tanks with rather sharply sloping bottoms down which the sludge would flow to a sump and outlet pipe or else, if the bottoms were flat or relatively so, mechanically operated scrapers to push the sludge to the outlet. The Dortmund, Travis and Imhoff tanks had sharply sloping bottoms, so in them no scrapers were required, but their depth and rather complicated structure were against them, although not preventing the building of hundreds of Imhoff tanks.

Of late there has been a tendency here to go back to the one-story or plain settling tank. This, together with the great increase of sewage-works in numbers and size, paved the way for the wide use of mechanical sludge scrapers, indicated and facilitated by their adoption in the metallurgical and other sludge-producing industries. The increased use of the activated-sludge process has also stimulated the use of plain settling tanks and automatic sludge-removing devices, here, too, in connection with hydrostatic pressure from the settled or settling sewage.

With the adoption of the activated-sludge process new problems in sludge handling have arisen, due to the bulk and other characteristics of the sludge produced. At Milwaukee, where more study has been given to the activated-sludge process than elsewhere in the world, a special type of sludge remover has been designed. Instead of pushing the sludge to the outlet pipe, the engineers at Milwaukee have devised apparatus the arms of which pick up sludge as they revolve horizontally at the bottom of the tank, taking it in through hydraulically proportioned apertures. Among other advantages, set forth on another page, they claim no harmful disturbance of the sludge and a high efficiency generally.

As was the case with the widely used scrapers, a revolving intake system was used abroad years ago, but in both cases the early form was relatively crude—the foreign intake apparently being nothing but a revolving perforated arm.

Automatically operated sludge removers of one kind or another are bound to increase in variety and extent of use. They are already widely employed in water treatment and in a variety of industrial operations. They are in line with the universal substitution of power for hand labor.

Time to Build

NOW AND THEN it is worth while to forget the business cycle, or at least to discard its terminology, and take a homely look at facts. Such a time is at hand. Regardless of trends or causes of trends, the construction industry is short of work. Money is not being spent for homes, for factories or for office and apartment buildings in anywhere near normal volume. And the reason, regardless of what we call the present stage of the business cycle, is plain. Everyone is waiting for a bargain.

It is now nearly a year since deflation began. The various indexes of business activity—steel mill operations, building contracts, electric power output, car loadings, commodity prices, interest rates—have steadily declined. Considering only building materials, in October, 1929, the basic steel price was $1.90; it is now $1.65. Brick was $14.50; it is now $13. Pine has declined 6.5 per cent, fir 18.5 per cent. Hollow building tile prices alone have remained stable. Cement at $1.95 is higher than it was in October, but is below the $2.05 price which held from 1925 to September, 1929. Briefly, not since 1922 have building materials prices been so low. Other factors in construction point to advantages over recent years. Manufacturers of equipment and accessories, anxious to keep plants going and men employed, have reduced prices. Labor itself, working under the threat of possible unemployment, is more efficient than for several years past. Slack business has fostered keen competition among contractors and fabricators who are waiting hungrily for invitations to bid.

Granted a bargain day has arrived, can we expect bigger and better bargains to follow? Economists generally are answering this in the negative. They are pointing to several factors which indicate that bottom has been reached. Credit conditions, which are fundamental to increased business, are wholesome. The rate of credit expansion, after a year of decline, has now reversed itself and is nearly normal; in step with business, both should move ahead. Resistance to further decline in commodity prices is seen in the upturn of some of them. Signs of an increase in residential building are reported by mortgage companies and building loan associations. Crops are going to be good, which means revenue for the railroads if not for the farmers.

It is worth while to keep in mind that business has now been marking time for nearly a year. Such an unusual situation in a country so completely convinced of the close relationship among prosperity, construction and industrial activity is not normal and must eventually change. The facts cited above herald the change. The tide is on the turn. It is time to build.

Operating Procedure in Vending Truck-Mixer Concrete

Proportioning Plant, Truck Mixers, Receiving Materials, Loading Trucks, Controlling Mixture, Testing Product and Merchandising Practices in a Ready-Mixed Concrete Business of 350 Cu.Yd. Daily

By Miles N. Clair
Vice-President, Thompson & Lichtner Co., Inc., Boston, Mass.

THE manufacture of ready-mixed concrete involves two general plans of procedure. In the central-mixing-plant plan the materials are brought to a central plant, where they are proportioned and mixed, the resulting concrete being conveyed to the job by special trucks. In the central-batching and truck-mixing plan the materials are brought to a central-batching plant, where they are proportioned, loaded into special mixer trucks and conveyed to the job. The mixing is done in transit or after the truck has arrived at the point where concrete is to be placed.

The preliminary study made by the management of the Boston Transit Mixers, Inc., caused it to decide upon a central batching plant using mixer trucks, as best suited to produce high-grade uniform-quality concrete. The plant operated by Swigert, Hart & Yett, of Portland, Ore., was found to be the best arranged of any using this system, and Porter Yett, of that organization, was engaged to design a plant which would include certain special mixer-truck charging apparatus patented by him. The plant is located in the Roslindale, Mass., material-supply yard of the Whittemore Co., one of the financially interested organizations. The general layout and the equipment are shown by the illustrations. The materials are brought to this plant by truck or railroad, batched, loaded dry into the special mixer trucks and mixed in transit to the job or after the job is reached.

Batching Plant Equipment

Aggregates are stored in a four-compartment bin which has three 50-ton sections used for sand, 1-in. gravel and 2-in. gravel respectively, and a fourth section of 35 tons capacity for special materials. Aggregates are delivered by truck and hoisted to the bins by bucket elevator. There is a 700-bag cement-storage bin located next to the aggregate bins. Bulk cement is used and is unloaded with a power scoop directly into the boot of a bucket elevator. There is an additional 750-bbl. storage bin which feeds by gravity to the boot of the cement elevator. Space is provided for the storage of admixtures on the weighing floor of the plant.

City water is used, although a well is available on the site, and is batched by volume in a 200-gal. tank. A special water meter was first installed for measuring the water, but it was unsatisfactory. All aggregates and cement are proportioned by weight. The dry batch is loaded into the mixer truck through a special hopper and spout which can be readily adjusted to meet variations in the position of the truck.

The scheduling of aggregate deliveries so that sufficient material will be on hand and so that there will be no mixing of materials requires careful attention. There is only one aggregate elevator so that only one material can be taken at a time. The man running the elevator must see that the elevator is empty before a change in material is made. The plant foreman keeps the plant manager notified as to the amount of material on hand. The plant manager puts in his order for materials for the next day as soon as his concrete deliveries schedule is made up and adjusts this order from time to time during the day as the requirements change. The bins are filled each night so as to be ready for the next day.

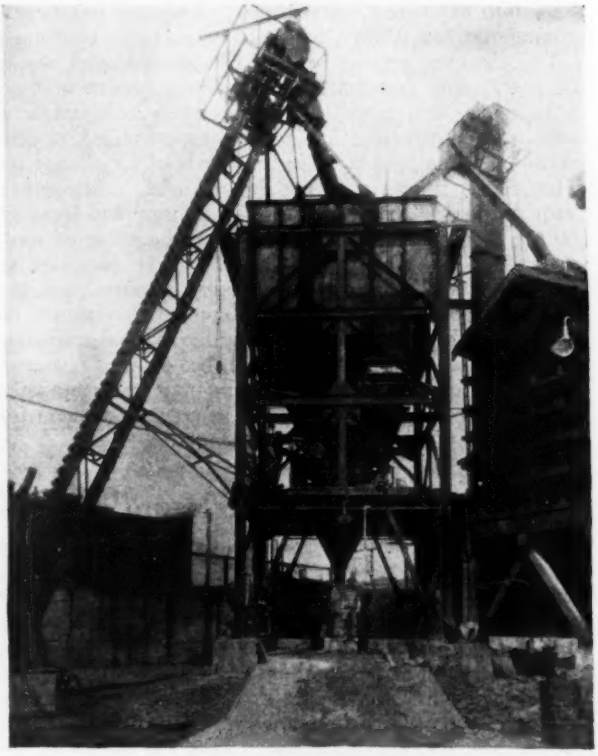


FIG. 1—OPERATING ELEMENTS OF BATCHING PLANT FOR TRUCK-MIXER CONCRETE

The cement is unloaded by contract for 3c. a barrel. Two men unload three cars a day and this work requires very little attention from the management.

Mixer Trucks

The mixer trucks are special and are of 3-cu.yd. capacity. The truck drum is a steel cylinder narrowing to a cone at one end, with an 18-in. opening through which the dry batch is loaded and the concrete discharged. The inside of the drum has baffle plates arranged to expedite the mixing and discharge of the concrete. It is mounted on a truck chassis, and is rotated in one direction for mixing and in the opposite direction for discharging. The drum can be tilted to facilitate complete discharge. Water is carried in a two-compartment tank; one of 165-gal.

capacity holds water for the batch, and the other, of 45-gal., supplies water to flush the body after unloading. The water is fed to the batch through a perforated pipe running along the axis of the drum. The trucks are also provided with a small section of chute, and a frame is attached to the truck for its support. The plant is at present operating nineteen of these 3-yd. mixer trucks.

Operating Force and Procedure

The force required for operating the plant consists of 32 men having the following duties: one plant manager, one contact engineer, one shipping clerk, one plant foreman, one truck foreman, nineteen truck drivers, two cement unloaders, one cement weigher, one aggregate weigher, one admixture man, one truck-loading man, one aggregate elevator man and one bookkeeper and telephone operator.

Orders are received by the shipping clerk, who enters them in an order book. When there are conflicts in regard to delivery requirements, the plant manager handles the matter. At about 4 p.m. each day these orders are gone over by the plant manager and a provisional schedule set for the next day. Changes in the weather and job conditions usually make it necessary to adjust this schedule many times. The shipping clerk keeps the schedule and assigns the trucks to the jobs in the order in which they become available at the yard. The messenger keeps the shipper informed as to the trucks available and takes the plant copy of order slips, made out by the shipper, to the weighers. This slip is made out in quadruplicate, so that one copy remains for the office record, one goes to the weighers, one is retained by the customer and the original is signed by the job foreman and returned as a receipt.

The order slip (Fig. 5), specifies the quantity, the mix, the water content and any special conditions. The

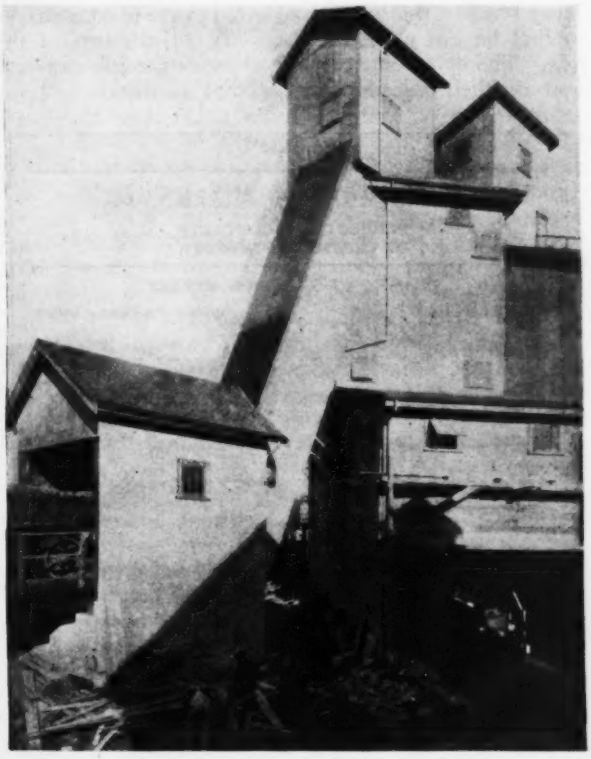


FIG. 2—BATCHING PLANT HOUSED FOR SHELTER AND WINTER MIXING

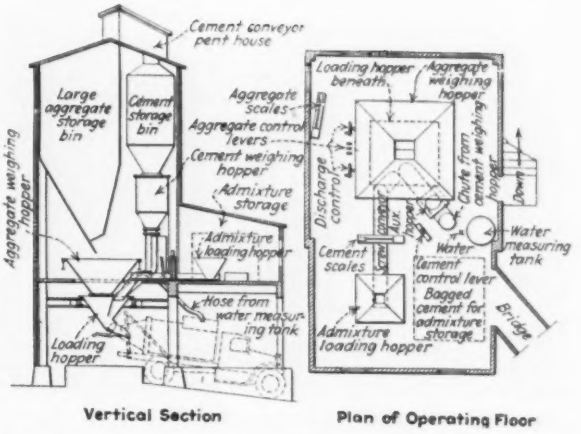


FIG. 3—VERTICAL SECTION AND OPERATING FLOOR PLAN OF BATCHING PLANT

weigher refers to charts which translate these requirements into weights of materials per 1½-cu.yd. batch. One scale is used for both sand and gravel: the sand is weighed first and then the gravel. The cement is weighed in a separate container fed by gravity from the overhead storage bin. Air jets are used to break up any arching in the bin. Careful attention is given to the way in which the materials are admitted to the mixer drum, so as to prevent sticking in the hopper or spout, and to insure a uniform mixture. The materials are admitted simultaneously, the sand and cement riding in on the gravel. The mixer drum is rotated at 10 r.p.m. while being loaded.

The water for the batch was formerly admitted to the truck tanks by the truck driver who operated a special water meter by pull cords. At present this meter is not used, and the man who spots the loading hopper and operates the loading spout also loads the water, drawing it from a graduated tank.

When the truck is loaded the cement weigher blows a whistle and the messenger gets two copies of the form shown in Fig. 5 from the shipper, the original of which is time-stamped, and gives them to the truck driver with any special directions. At the same time the messenger usually takes with him the order slip for the next batch, also time-stamped, which he gives to the weighers. Meanwhile the cap has been put on the 18-in. hole at the end of the truck drum and the truck has started on its way, a new truck immediately backing into position for loading. The messenger next collects the return receipts from the newly returned trucks and gives them to the shipper for time-stamping.

It is apparent that the procedure followed gives a definite record of the time required for loading and for delivery. The shipper also keeps a continuous record, based on the time-stamp records, on a form showing truck number, time of start and return, elapsed time and destination. The average time required for loading is 2½ minutes, and the average time required for delivery is one hour for the round trip.

The truck driver starts the rotation of the mixer drum and adds the water when he is about a mile from the unloading point. This usually insures a good five-minute mix and the concrete is ready to pour when the truck reaches the job. After the concrete is discharged from the drum, the washwater is added and the drum is rotated for about five minutes. On the return to the plant this water is dumped out. Very careful attention is given

FIG. 4—TRUCK-MIXER DELIVERING CONCRETE FOR STREET PAVING

to the trucks and each night the driver is allowed fifteen minutes to clean the truck inside and outside. A washing machine which supplies a high-pressure stream and conserves water is employed for this purpose. The waste water is drained through a sand filter so as to protect the sewer system.

The trucks are governed so that the speed cannot exceed 25 miles per hour, and the truck foreman at frequent intervals follows the trucks to check up on the care with which they are being driven. New drivers are also given careful training by a representative of the manufacturer of the truck, so that the proper methods of operation will be followed. The trucks are carefully serviced every night in a near-by service station not operated by the company; the service station reports work done, using a standard form, from which and the shipper's record, the plant manager makes up his monthly report of the truck cost on the form shown in Fig. 6. Several different truck chassis are in use and in general all have stood up well under the severe service required.

Concrete Control

The procedure employed to insure concrete quality is (1) accurate batching of the materials; (2) the use of quantities per batch based on a study of carefully conducted tests of the materials; (3) continued testing of the materials and adjustment of the quantities used; (4) testing samples of the concrete at regular intervals; (5) careful instruction of the drivers (who do the mixing); and (6) intensive educational work among customers.

Weighing the materials was adopted as being accurate and rapid, and as readily allowing changes in proportions. It has been found also to allow of quick changes of mix. City inspectors check the scales once a month.

At present concrete is made under a large variety of specifications, including the nominal proportions (such as 1:2:4) by volume; a specified strength; a specified water-cement ratio and cement content, and numerous combinations of these. Since weighing was to be used, some means of readily converting the given mix to a weight basis had to be provided. Tests were made on samples of the materials to be used, and these data, along with other data from previous tests, were used as the basis for developing tables of quantities for 1 cu.yd. of concrete covering all the usual mixes, consistencies and strength requirements. These quantities have since been adjusted on the basis of the data obtained from routine tests of the materials since the plant has been in operation. Further changes will be made as data based upon tests of concrete made with the revised specifications accumulate.

It is recognized that as the materials change during the day, changes must be made in the tabulated quantities which are based on averages. The contact engineer or the plant manager makes the tests necessary to determine the changes. Moisture determinations are made on the sand and gravel the first thing in the morning, at about 11 a.m. and at 3 p.m., and also when decided changes occur for any reason. The quantity of water put in the truck is adjusted on the basis of these determinations so as to keep the water-cement ratio a constant. The weight per cubic foot of the materials is also found, and this factor is used to adjust the quantity of aggregates used. A complete mechanical analysis of a composite sample composed of the daily samples is made in the job laboratory several times a week. Samples are also sent to a local laboratory for complete test.

In the absence of the contact engineer and manager and when tests cannot be made, changes in the quantities are based on the average tabulated quantities which are given for dry, average damp and very damp conditions. Definite rules have also been set up to control changes in the quantities as the aggregate changes in grading. The principal effort, however, is made to control the materials at their source, and any trucks with material of obviously poor grading are not allowed to unload.

The truck driver does the mixing, adds the water and pours the concrete, and he is therefore a very important factor in the production of the concrete. These men are carefully selected and trained. Every two weeks they are given a talk by the plant manager and the faults of the several men are pointed out. The driver must look into his truck to see that the concrete is properly mixed before he dumps it. He must use only the water loaded for mixture and under penalty of discharge must add no more except on the order of the job foreman. If extra water is added this must be reported to the plant manager so that he can make the necessary adjustments in the mix. The driver must co-operate with the job men and transmit their objections to the plant manager.

RECEIPT

BOSTON TRANSIT MIXERS, Inc.

PERFECT MIX CONCRETE OF CERTIFIED STRENGTH

PLANT: 47 HARRISON STREET

MYRON A. HOWE, Mgr. **Phone: PARkway 1397**

Account of O'Connell

Roslindale, Mass. 11-8 **19** 29

Name Thompson Starrett

Address Federal & Franklin

CU YDS.	CONCRETE MIX	GRAVEL	AMOUNT
	1-1-2		

Rec'd by

No. 7270 **Load No.**

FIG. 5—ORDER BLANK FOR READY-MIXED CONCRETE

TRUCK COST SYSTEM

DAILY RECORD, MONTH OF_____: HOURS IN WORKING DAY_____FROM_____TO_____TRUCK NO._____

OPERATING DATA																		COST DATA																							
DATE	WEATHER	TEMPERATURE	NUMBER OF TRIPS	DELIVERY OR PICK-UP STOPS	TOTAL UNITS		MILES	TIME IN HOURS AND MINUTES										GASOLINE OR CURRENT		CYLINDER OIL		DRIVER COST	HELPER COST	COST OF REPAIRS						SUBSTITUTE VEHICLE RENTAL									
								AVAILABLE BUT NOT USED		LOADING		RUNNING INCLUD. STOPS		LAID UP FOR REPAIRS										ORDINARY				ACCIDENT									
					OUT	IN												GALS OR K. W. H.	COST	PINTS	COST			MATERIAL CHASSIS		LABOR CHASSIS		LABOR AND MATERIAL BODY		BODY AND CHASSIS									
								HRS.	MIN.	HRS.	MIN.	HRS.	MIN.	HRS.	MIN.																								
1																																							
2																																							
3																																							

FIG. 6—FORM FOR TRUCK PERFORMANCE AND COST DATA

Good concrete cannot be made when the customer wants a very wet mix, and the contact engineer therefore tries to help the contractor to work out a placing scheme that makes for quick truck getaway, and to educate him to the use of the drier, plastic and yet more workable concrete. Winter operation of the plant is being prepared for by completely inclosing the structure, and by the installation of a boiler to heat the water. It is expected that considerable educational work will be necessary to get the contractors to protect properly the concrete delivered to them during the winter season, and definite recommendations have been drawn up covering various probable conditions.

To know what kind of concrete is being produced a large number of tests were made. A set of six standard 6x12-in. specimens is made several times a week on the job by a local testing organization. Three of these are tested at 28 days and the other three at some other period ranging from one day to one year. These tests are made available to the customer and to the city. When concrete is delivered to projects in Boston, a form must be made out and sent in to the city building department. A weekly report must also be made giving the totals for the current week. This is not the only check the city has on the ready-mixed concrete plants, as the material weighers at the plants are really city inspectors, since they have to be approved by the building commissioner.

Merchandising Practices

The ready-mixed concrete plant has a problem not usually met with in ordinary construction, since it must produce in each batch a definite quantity of concrete. This is necessary so as not to give either more or less than the customer is charged for. The quantities for the batches were determined on the basis of the absolute volumes of the materials and numerous checks have shown that the actual delivered yardage per batch agrees well with the theoretical quantity. A 1-cu.yd. open cylinder is used for checking the volume produced. When there is any question, this cylinder is taken to the job and loads are checked there in the presence of the contractor. The usual cause of controversy in regard to quantity is due to the contractor neglecting to measure the forms with the concrete in place and thus including the increased volume resulting from the give of the forms.

The concrete is sold only through members of the organization and not direct to the consumer. The material dealers receive approximately 50c. per yard commission for their sales. An extra charge is made for admixtures equal to the cost of material and labor. It is planned to charge an extra 50c. a yard for the heated concrete supplied during cold weather. At present there is no limit specified for the length of the haul, but an extra charge at the rate of $4.50 per hour is made for delays on the job caused by the customer where the time exceeds 20 minutes.

The maximum daily output of the plant has been 523 cu.yd. and the average is 350 cu.yd. for an average working day of eleven hours. The plant manager is Myron A. Howe, with the Thompson & Lichner Co., Inc., of Boston, retained as consulting engineers to advise on problems of operation, quality control and investigations.

Concrete-Arch Mississippi Bridge at Minneapolis

Third of Type—Two-Rib Arches With Spandrel Walls Across Ribs—Curved Approach Spans—Built by Day Labor

TWO reinforced-concrete rib-arch spans of 265½ ft. in the clear form the channel portion of the new Cedar Ave. bridge across the Mississippi River at Minneapolis, Minn. They have a rise of 90.5 ft., with the crown about 110 ft. above low water. This is the third city bridge of this type over the river at Minneapolis, and like the first one, at Third Ave. South, it is partly on curves, although this was done for location purposes in the new bridge and not on account of foundation conditions, as in its predecessor. The two main spans are on a tangent of 611 ft., crossing the river on the skew. Three flanking arch spans on the west side and two on the east side are of 93-ft. span and are on curves of 5 deg. 41 min. and 5 deg. 18 min. respectively. The general design of the bridge is shown in Fig. 2.

All the arch spans have two ribs 12 ft. wide and 24 ft. apart in the clear, with a thickness for the main spans of 3.5 ft. at the crown and 7.5 ft. at the haunches. A three-center radius of 154 and 48.5 ft. is used for the intrados, and a single radius of 167.5 ft. for the extrados. Each rib of the main spans is reinforced with five steel ribs 31½ in. deep at the crown, having the chords composed of pairs of angles 3½x3½x½ in., with smaller angles for the web members. In the 93-ft. spans, each rib is reinforced with sixteen longitudinal bars at top and bottom, tied together with loop bars 4 ft. apart. Footings for the three river piers are 30x54 ft. At the east and center piers they rest on the sandstone bedrock at 11½ ft. and 22½ ft. below low water, while the west pier footings are supported on 180 piles 32 to 42 ft. long, driven in gravel formation and spaced 3 ft. c. to c. in both directions.

Transverse spandrel walls practically the full width of the arch ribs, and spaced 13 ft. 4½ in. c. to c. in the main spans and 12 ft. in the flanking spans, have cantilever brackets for the sidewalls and carry pairs of transverse 24-in. I-beams which support the 12-in. reinforced-concrete deck slabs. This construction is shown in Fig. 1. At the middle of the 40-ft. roadway this slab is dropped 4 in. for a width of 19 ft. to provide for a future double-track car line, as shown in Fig. 1, but no tracks have

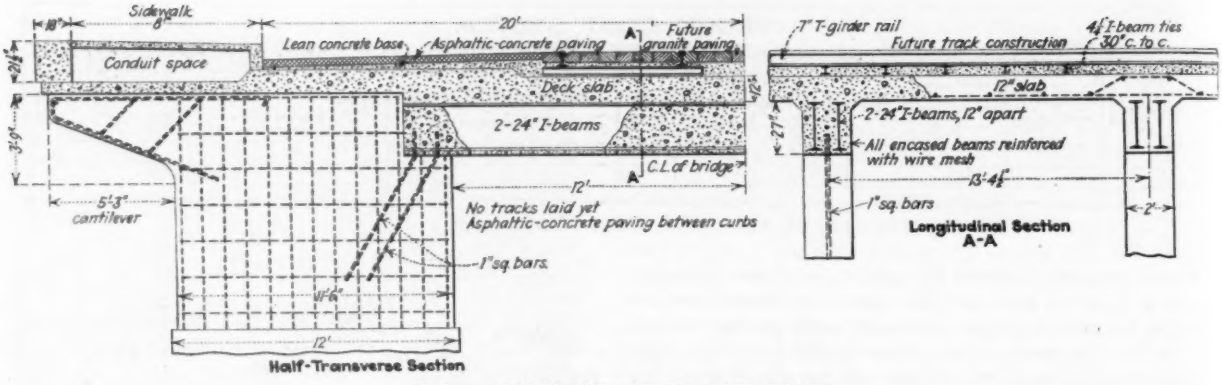


FIG. 1—CROSS-SECTION OF ARCH SPANS

been laid as yet. A filling of lean concrete supports the paving, which is of asphaltic concrete for the full width of roadway. Creosoted woodblock paving was proposed at first, the change being made on account of the tendency of the blocks to swell and heave in wet weather.

The paving details shown in section in Fig. 1 are those proposed to be used when the streetcar tracks are added to the bridge. The lean concrete fill makes it possible to add the tracks at a minimum of expense.

For each sidewalk a 6-in. deck slab over the spandrel columns carries a curb at the roadway and a heavy concrete beam 18x21½ ft. at the outer edge. Between the sidewalk slab and the deck slab is a space for gas mains and electric utility conduits, with a separate compartment for the city's electric conduits. Upon the outer beam is the concrete railing. Except for the rubbing of this railing to a smooth finish no special treatment was given to the exposed concrete surfaces for the sake of appearance.

Viaduct approaches on each side consist of concrete bents supporting closely spaced I-beams upon which is a 5-in. concrete deck slab. On the east approach there are ten spans of 25 to 46 ft. The west approach is somewhat longer and is complicated by skew spans and bents where the viaduct crosses a street intersection. From the west side there is a grade of 0.3 per cent on the approach fill and 0.75 per cent on the viaduct and flanking spans, beyond which the roadway has a grade of 0.75 per cent to the east end.

The two streets connected are not in a continuous line. From Washington Square, on the east side, at the junction of Cedar Ave., Washington Ave. South and Fifteenth Ave. South, the west approach is an extension of this last street for about 1,200 ft. A fill between concrete retaining walls forms the first half, beyond which is the viaduct construction already described. Then the three 93-ft. arch spans are on a curve of 5 deg. 41 min. to the north, with the two 265½-ft. spans on a tangent, followed by a curve of 5 deg. 18 min. to the south, which includes the two 93-ft. arch spans and the end spans of the 350-ft. girder viaduct of the east approach. Beyond this the viaduct and the 350-ft. fill form an extension of Tenth Ave. Southeast. This location and alignment was adopted in order to avoid the plant of the Minneapolis Gas Co. on the west side of the Mississippi River.

The Cedar Ave. bridge was designed by K. Oustad, city bridge engineer, and Frederick T. Paul, assistant bridge engineer, under the direction of N. W. Elsberg, city engineer. It was built by day labor under the supervision of Mr. Paul, as was the case with the two other city bridges already mentioned. It was completed Sept. 1, 1929, at a cost of about $1,260,000 provided by bonds.

Descriptions of the other concrete arches over the Mississippi River at this point were published in *Engineering News-Record* Jan. 25, 1923, p. 148; Nov. 4, 1926, p. 732; and Nov. 10, 1927, p. 754.

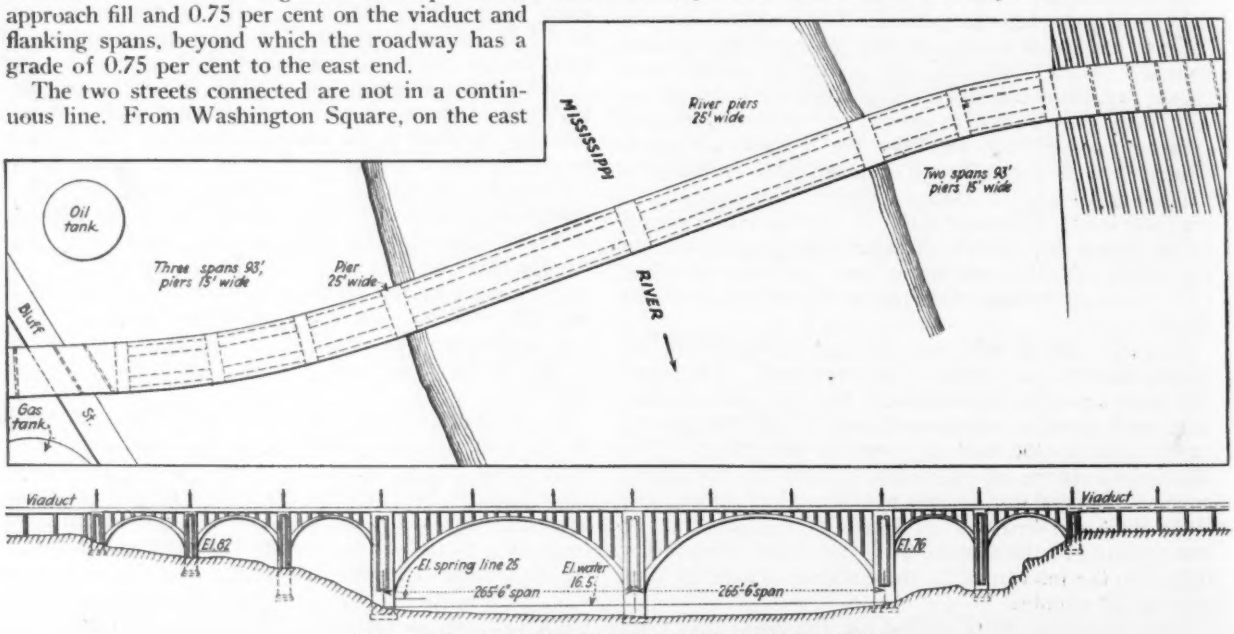


FIG. 2—CEDAR AVE. BRIDGE, MINNEAPOLIS, MINN.

A Survey of the 1923 Earthquake Damage to Buildings in Tokyo, Japan

Dr. Naito Reports, Building by Building, on Modern Structure Damage and Repair Costs—Attention to Types of Structural Design

By Henry D. Dewell
Structural Engineer, San Francisco, Calif.

Dr. Naito's Report contains information not heretofore available, of value particularly to structural engineers. Mr. Dewell was asked to make the abstract of the report for publication in *Engineering News-Record* because to readers of this journal he is known as an able student of earthquake-resistant construction. His selection of those features of the report that will be of most value is authoritative and his interpretative comment is unprejudiced.—Editor.

After the great earthquake of September, 1923, rocked Japan and caused the greatest damage to buildings within the history of modern steel and concrete construction, a considerable number of engineers went to Japan to examine the ruins. The rush and confusion of the period immediately following the catastrophe, however, and the difficulty of assembling at that time detailed information about design and construction methods in Tokyo (where the more important of the damaged structures were located) seem to have prevented much of the desirable detailed information from reaching America.

Late in 1928 the Board of Fire Underwriters of the Pacific wanted specific information about the design, nature of the damage and cost of repairs on modern structures in Tokyo and did not find this information available in the United States. They therefore engaged Dr. T. Naito, of Waseda University, Japan, to report in detail on twelve of the more important buildings, particularly as to the structural design, foundation conditions and cost of repairing damage.

Dr. Naito was eminently fitted for this work. He is regarded as perhaps the leading Japanese authority on earthquake-resistant construction and has been in constant touch with design and construction methods as employed in Japan. Dr. Naito made the desired survey and early in 1929 submitted his report in the form of a number of pamphlets, one for each building considered. Each pamphlet includes floor plans of the building, photographs, sketches from the construction drawings, sketches of earthquake damage and concise but comprehensive data about each structure. From these pamphlets have been selected those data which the writer regards as of most value to structural engineers in America. For the convenience of the reader the statistical data, in so far as feasible, have been arranged in the accompanying tabular form.

Perhaps the best introduction to Dr. Naito's report is given in his own comment upon it in a letter to the Board of Fire Underwriters of the Pacific, dated Aug. 19, 1929. The following extracts from his letter are quoted verbatim:

To explain the condition [with respect to building construction at the time of the Tokyo earthquake] I think it is better to state a short note about the building construction of modern Japan. Foreign architecture was introduced from England; the construction is of brick and wood and the workmanship was after the English practice. The great earthquake of 1891 (Mino-Owari Earthquake) and the establishment of Imperial Earthquake Research Inst. (1892) made the construction and workmanship quite extraordinary. The people paid very much attention to the earthquake proofing, brick laying was done very carefully with good mortar and with steel band embedded (say reinforced brick).

Quite many old brick buildings (2-3 story) around Imperial Moat (Mitsubishi building and Governmental buildings) are the examples of these times. And these brick buildings stood quite well except little damage. Metropolitan Police Building built later the workmanship quite near to the former and almost untouched.

The time passed the impression of earthquake gradually gone the workmanship to usual then to bad and worse.

At the time of war quite many buildings put up very rapidly without paying much attention to the construction and workmanship.

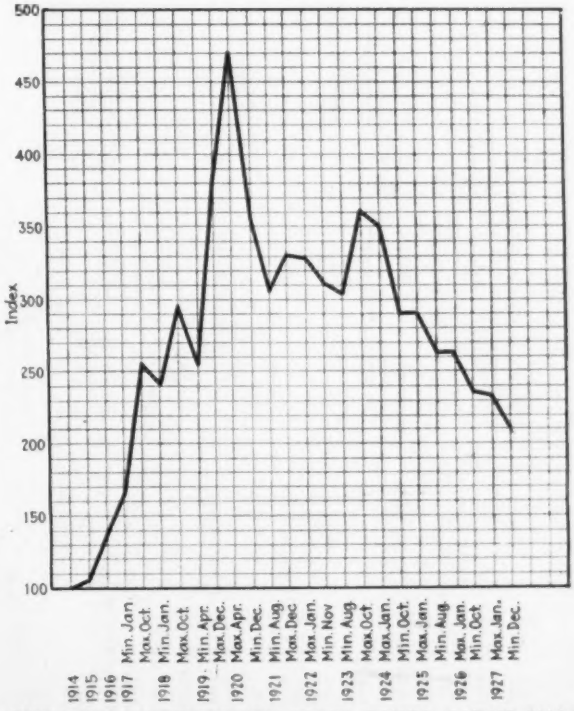
About 1920 Maurnouchi building started by Fuller & Company of N. Y. with entire American practice; "the speed of construction" seems to the first from anything else.

Everybody praises it and went after them, Tokyo Kaikan and Naigai etc. are the examples of it.

Mr. Watanabe, the architect of Japan Industrial Bank, too insisted to follow it, but I opposed and made the main part with reinforced concrete walls, but about sixty per cent was left as brick (not to my will); Kabuki theatre and Jitsugyo building are entirely reinforced concrete.

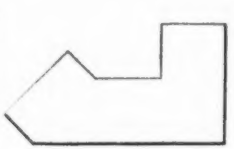
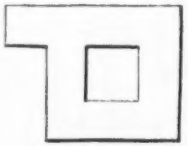
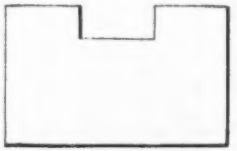
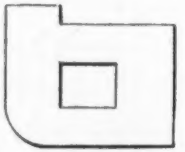
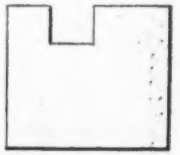
The great earthquake of 1923 tested everything. And now we (our architect and engineer) don't use brick from the point of strength and economy, reinforced concrete are much preferred.

Dr. Naito is a firm believer in the rigid type of building for earthquake-resistant construction, as may be judged by the preceding paragraphs. He is the author of a text, "Earthquake-Proof Construction," which has been translated into English, but not yet published, by



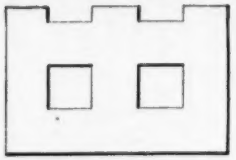
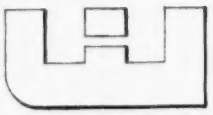
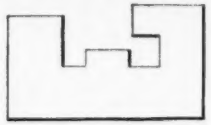
BUILDING CONSTRUCTION COSTS, TOKYO, JAPAN, 1914-27

TABULATED DATA ON TWELVE MODERN BUILDINGS IN TOKYO, JAPAN, WHICH PASSED THROUGH THE EARTHQUAKE OF SEPT. 7, 1923

	Kabuki Theatre	Jitsugyo Building	Nippon Kogyo Bank (Japan Industrial Bank)	Chiyoda Building	Yuraku Building Japan Oil Building	Tokyo Kaikan Building
General shape						
Number of stories (All buildings also have basement)	4	5	7	7	7	5
Height	To eaves 54′ To ridge 98′ 5″	To parapet 71′	To parapet 98′ 5″	To parapet 96′ 5″	To parapet 100′	To parapet 86′
Maximum horizontal dimensions	128′x237′	41′x130′	131′x193′	126′x129′ 5″	154′ 5″x160′	144′x144′
Total floor area (sq.ft.)	114,000	38,200	146,000	123,500	168,500	112,500
Foundation soil	Hard clay 16′ down Sand 1′yr 20′ down (und. stg.)	Compact sand	Mud at surface Gravel 60′ below	.....	.....	Mud to 50′ below surface
Type of foundations	R.C. spread footings on pounded crushed rock	R.C. spread footings on pounded broken stone partly on piles; 6′-9′ long	Timber piles—45′ long; independent R.C. column footings but tied by rigid R.C. slab	Timber piles—15′-18′ long; R.C. independent column footings	Timber piles—45′-50′ long; Independent R.C. footings interconnected by tie beams	50′ pedestal piles, 17″ diam. independent footings
Structural frame (All have R.C. floors)	Principally R.C. Roof trusses, balcony framing and supports—S.S.	R.C.	Structural steel; rigid connections; intermediate floor beams, R.C.	R.C. with S.S. frame	S.S.; column fireproofing of hollow brick trussed spandrel girders	S.S.; columns fireproofed with brick; steel floor beam with M. L. & P.
Walls	Mainly R.C.; some basement walls brick	R.C.; also certain bracing walls R.C.	.....	.....	.....	.....
Type			Curtain	Curtain	Curtain	Curtain
Material	Mainly R.C.; some basement walls brick	.....	Principally combination solid and hollow brick; R.C. bracing walls	R.C., brick and stone	Solid and hollow brick.	Solid and hollow brick
Ornamentation	Mortar finish Ornamental stone	Belt courses, stone, tile, terra cotta, mortar	Granite and terra cotta	Granite, mortar, tile	Stone and terra cotta	Stone, tile and mortar
Original cost (yen)	1,500,000 bldg. 655,000 equipment	420,000	3,600,000	1,160,000	4,400,000	2,290,000 bldg. 622,000 equipment
Date completed	Dec., 1924	Sept., 1924*	May, 1923	Sept., 1925†	July, 1922	Oct., 1922‡
Earthquake damage	None	Slight—interior walls	Slight; none to frame, walls or floors	None to frame and floors; some stone and brick of walls fell	None to frame and floors; very heavy to walls and elsewhere	One of the worst damaged in Tokyo, including frame
Fire damage	Steel trusses fell Steel damaged	.....	.....	Heavy	.....	.....
Cost of repairs (yen)	.....	.....	.....	2,600,000	Not repaired at date of report	1,010,000
Earthquake (yen)	.....	70,000	20,000	Not known	.....	860,000 bldg. 150,000 equipment
Fire (yen)	300,000	.....	.....	Not known	.....	.....

* Almost completed at time of earthquake. †Concrete work completed to fifth floor at time of earthquake. ‡ This building under construction in earthquake of April 26, 1922; severely cracked but repaired.
R.C.—Reinforced concrete. S.S.—Structural steel. M.L. & P.—Metal lath and plaster.

TABULATED DATA ON TWELVE MODERN BUILDINGS IN TOKYO, JAPAN, WHICH PASSED THROUGH THE EARTHQUAKE OF SEPT. 7, 1923

	Yusen Building (N. Y. K.) Building	Tokyo Kaijo Building Insurance Building	Mitsui No. 3 Building	Nippon Kogyo Club	Mitsukoshi Department Store	Marunouchi Building
General shape						
Number of stories (All buildings also have basement)	7	7	8	5	7	9
Height	To parapet 100′	To parapet 91.5′	To parapet 104.2′	To parapet 75′	To parapet 100′ To tower 100′	To parapet 102.5′ 119.5′
Maximum horizontal dimensions	153′x288′	166′x298.5′	70′x119′	145′x152′	120.5′x348.2′	274′x331.75′
Total floor area (sq.ft.)	304,000	186,500	65,000	76,500	293,500	660,000
Foundation soil	Mud; gravel at 120′ below surface	Mud at surface gravel 60′ below	Gravel 27′ below surface	.....	Clay with gravel	Mud and clay at surface; gravel 50′ below
Type of foundations	Timber piling—45′-50′; independent R.C. footings	"Compressol" piles—15′-20′; R.C.footings,interconnected	Timber piles—20′-35′	Timber piles, R.C. footings independent	Timber piles—12′-20′, R.C. footings; intereonnected with slab	Timber piles—45′-50′, R.C. independent footings
Structural frame (All have r.c. floors)	S.S.; columns fireproofed with hollow brick, R.C. in first	S.S.; intercolumns fireproofed with R.C.	R.C.	R.C.; partly S.S.	S.S.; columns fireproofed with solid brick	S.S.; basement and first story interior columns fireproofed in R.C.; remainder in brick
Walls	.....	.....	.....	.....	.....	.....
Type	Curtain	Curtain	Curtain	Curtain	Curtain	Curtain
Material	Solid and hollow brick	Solid brick, reinforced	Solid and hollow brick	R.C.(5″ thick)	Solid brick to sixth floor, sixth and seventh—R.C.	Solid and hollow brick (13′ thick)
Ornamentation	Terra cotta, stone, tile	Stone and tile	Stone and mortar	Stone and tile	Stone and tile	Stone and tile
Original cost (yen)	7,100,000	1,700,000	800,000	1,409,000	3,000,000	10,000,000
Date completed	May, 1923	Sept., 1918	1920	Nov., 1920	Sept., 1914	Feb., 1923
Earthquake damage	Heavy; confined to lower stories; no damage to frame	None to frame and floors, walls and partitions cracked, building showed settlement 5″-12″	None to walls and floors; very slight to frame and partitions	Walls badly cracked, R.C. frame damaged, floors cracked	Brick walls cracked. No damage, frame floors; small damage	Walls and partitions severely cracked; knee braces of S.S. frame ruptured and some diagonal cracks in floors
Fire damage	.....	.....	.....	.....	Great	.....
Cost of repairs (yen)	1,800,000	300,000	60,000	.....	6,000,000*	3,000,000
Earthquake (yen)	1,000,000 repairs 800,000 remodeling	.....	.....	505,000 repairs 139,000 remodeling	.....	.....
Fire (yen)						

* Cost of repairs includes many items not properly chargeable.
R.C.—Reinforced concrete. S.S.—Structural steel. M.L. & P.—Metal lath and plaster.

the special committee of the American Society of Civil Engineers on the effect of earthquakes on engineering structures.

Examination of the data presented in the table indicates the generally very poor foundation materials on which these buildings were erected. The Kabuki Theater and the Jitsugyo Building appear to be exceptions to this statement, and the better soil under these buildings may have served to lessen the shock to which they were subjected.

Footings which are interconnected are generally considered as effective in lessening the damage to a building during an earthquake, in that the connecting members, if of suitable proportions, tend to distribute the shock throughout the whole foundation. Of the twelve Tokyo buildings listed, only four are stated definitely to have had their footings connected, but these four buildings suffered no damage to frame or floors, although the walls of one, the Japan Oil Building, were heavily damaged. On the other hand, the Tokyo Kaikan Building, in which the footings are not noted as interconnected, was one of the worst damaged in Tokyo. The evidence thus seems favorable to the value of the interconnection of footings, especially for buildings supported on pile foundations.

The shape of the floor plan is undoubtedly a factor in the ability of the building to resist earthquakes, the square or rectangular plan being the most advantageous. Buildings of U or L shape are likely to suffer damage at the junction of one part with the other. Thus the Tokyo Kaijo and the Jitsugyo buildings, particularly the former, and the Nippon Kogyo Club are unfavorably shaped. With poor foundation soil, severe damage might be expected in these buildings unless they were specially designed to provide for these drawbacks. The Jitsugyo Building was designed by Dr. Naito for resistance to earthquake and was undamaged by the earthquake, but the two other buildings of this group of three suffered considerable damage.

The Tokyo Kaikan Building, with a structural steel frame and brick walls, suffered terrific damage, the frame being permanently distorted with bracing ruptured. It is the outstanding demonstration of the fact that a building with a structural steel frame is not necessarily and inherently immune from earthquake damage.

On the other hand, the Nippon Kogyo Bank is an example of a building with a structural steel frame, supported on pile foundations, with its floor plan considered to be disadvantageously oriented with respect to the direction of the earthquake force, in that its longitudinal axis is in a north-to-south direction, with brick masonry exterior walls and with a large open banking room, yet whose frame walls and floors suffered no earthquake damage. But this building was carefully designed against an earthquake shock, treated as a rigid structure. Special reinforced-concrete bracing walls were used as considered to be most effective. Dr. Naito makes reference to this building in his "Earthquake-Proof Construction," and states: "The connections of columns and beams were made very simple, and originally calculated earthquake-proof walls were employed, the main portion of the lateral force being taken care of by these walls. As a result, cracks due to the deformation of the steel were not seen. Thus, this method of providing resistance against the earthquake shock was proved to be very effective."

The figures given in the table for cost of repairs show that these costs were heavy. No attempt has been made to express these in percentages of the original costs of the buildings, since it is felt that all the factors entering into the repair costs are not known. Dr. Naito has prepared a graph indicating the fluctuation of building construction costs in Tokyo for the years 1914-27, which is reproduced in the accompanying diagram.

As an appendix to his report on the Marunouchi Building Dr. Naito gives the results of some rough calculations on the ability of the structure to resist an earthquake having a horizontal acceleration of three-tenths gravity. His computations are based on the assumption that the building acts as a rigid structure and that the total force of the earthquake is distributed among the various structural units, consisting of structural frame, walls and bracing partitions in proportion to their rigidities. He finds that during the 1923 earthquake the tensile stress on the steel bracing in the third story was 64,000 lb. per sq.in.; the shearing stress on exterior brick walls 215 lb. per sq.in.; and the shearing stress on hollow brick walls 86 lb. per sq.in.

Similar computations made on the building after its repair and reinforcing (subsequent to September, 1923) for the same acceleration show the tensile stress on the steel bracing to be 28,500 lb. per sq.in.; the compression on the concrete and the tension in the steel reinforcement of the reinforced-concrete exterior walls to be 800 lb. and 32,000 lb. per sq.in. respectively, and the stress in the steel reinforcing of reinforced-concrete bracing partitions about 32,000 lb. per sq.in. Dr. Naito concludes, therefore, that the Marunouchi Building, as now repaired, is safe against future earthquakes.

South African Railways in 1929

THE government railway system of the Union of South African aggregated 12,647 miles of line at the end of March, 1929, according to the annual report of J. R. More, general manager of railways and harbors. This total included 160 miles opened during the year; in addition, 600 miles were under construction. All these lines are of 3½-ft. gage. There were also 684 miles of private railways. During the period 1922-28 the government authorized the construction of 2,062 miles, of which 1,460 miles have been completed and opened to traffic. In 1929 it authorized other lines aggregating 106 miles. Wood ties are mainly imported, but there are 65,435 acres of tie plantations, with 34,000 acres planted. On branch lines the use of steel ties is being extended. Several relocation works are under way for grade and line revision, and harbor improvements are in progress at the principal ports.

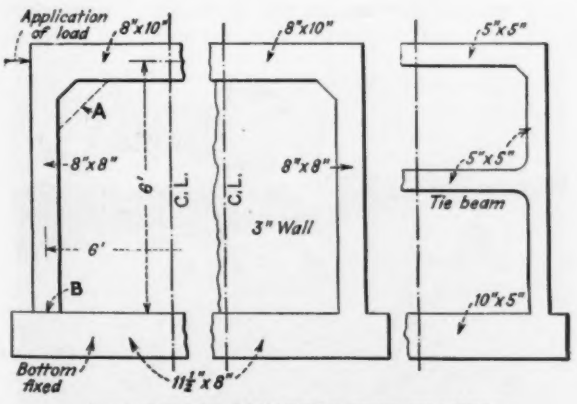
Road-motor service is being extended rapidly, largely for feeder service in agricultural districts, but in view of severe private competition the government has appointed a commission to consider means for better control and regulation. Electrification has proved disappointing on the suburban lines on account of the increasing competition by motor buses, street cars and automobiles, a condition which was not foreseen when the electrification project was studied. It has been financially disappointing on both suburban and main lines on account of the high charges for current, which is supplied from government plants not under the control of the railway administration. The new chief engineer is H. L. Pybus, who succeeded R. C. Wallace, retired.

Tests on Concrete Frames Simulate Effects of Earthquake Action on Buildings

IN THE DESIGN of earthquake-proof construction the problem of vibration is of vital importance. Many monolithic buildings and industrial structures are composed of heavy exterior frames and interior wall frames, and have heavy loads or machines located at eccentric positions, so that earthquake vibrations might cause rotating vibrations which would produce more deflections in the weaker frames rather than constant deflection in each story. The results of a series of tests on reinforced-concrete frames to determine the action of several details of construction under repeated horizontal loads are reported below as an abstract of a paper read before the recent international engineering congress in Japan by Mikishi Abe, consulting engineer, of Tokyo. The tests were made at the University of Illinois.

In the tests, periods of free or natural vibration of the reinforced-concrete frames were measured in order to compare them with known formulas. Four main points considered were: (1) the behavior of the frames under horizontal loads repeated many thousand times; (2) the free vibration periods before and after cracking of the frames; (3) the effect of construction joints upon horizontal deflection under repeated static horizontal loads; (4) methods of improvement in design and construction.

Test Frames—The rectangular frames made, as shown in the accompanying illustration, were 6 ft. wide c. to c. of columns and 6 ft. from top of concrete base or sill to center line of top girder, with different sizes of haunches or brackets between the columns and the girder. Columns were 8x8 in. and girders 8x10 in. In some cases the columns were fixed at the base, while in others a construction joint was used. Frames of the same dimensions, but subdivided by a horizontal tie-beam, had the columns, girder and tie-beam all 5x5 in. Two frames were filled in with walls. With a frame set in the testing machine, horizontal static loads exceeding 2,000 lb. were applied at the center line of the top girder and repeated 5,000 to 60,000 times by means of a spring dynamometer.



REINFORCED-CONCRETE TEST FRAMES

At left: open rectangular frame. Middle: frame filled in with monolithic wall. At right: frame subdivided by tie beam. Dotted line at *A* shows larger haunch of some frames. Dotted line at *B* indicates construction joint at base of column in some frames, while others had the columns and sill of monolithic construction.

Summary and Conclusions—The results of the tests are stated by Mr. Abe to indicate a fair agreement between tests and analyses, and his conclusions may be summarized as follows:

1. The frames showed great flexibility. The observed stresses were not increased by repeated application at low loads. Under high loads, stresses were slightly increased by repetition, but the intensity of stresses was well within the computed values. Development of tension cracks by repetition of load would naturally produce more stresses in the steel at the section. Under repeated horizontal loads the elastic action of the frame was not affected by construction joints in the columns where dowel bars were used. In the intermediate tie-beams the stresses were higher than those in the other parts of the frame.

2. The periods of free vibration of the test frames, measured by the aid of motion photographs, were about 0.03 second, before any cracks had developed. These vibrations died out after a few seconds. After cracks developed, the vibration periods were about 0.04 second. From these results it is argued that there is small possibility of synchronizing the natural vibrations of a building frame with vibrations of a great earthquake after the composing members have been cracked.

3. The horizontal deflections of a frame with ordinary construction joints at the feet of the columns were almost equal to those of the frame with no such joints, but were much larger than where dowels were used. The introduction of dowel bars in the construction joint was very effective in reducing the horizontal deflection of the frames. Such joints in multi-story buildings are generally unavoidable, but are objectionable in case of earthquake vibrations. Doweled joints increase the reliability of the structure and cost very little.

4. The use of large haunches at the end of the beam was apparently inadvisable, because many small cracks appeared in the haunches. The bending stresses were much reduced at the top of the columns, while the stress at the bottom was not altered by the use of large haunches.

5. The actual stress in the reinforcing steel at the junction of the column with the base was smaller than that obtained by analysis, due partly to concrete tension and partly to insufficient fixity at the bottom of the column. The bending moment at such a joint will be much reduced by flexure of the tie-beam.

6. In the test frames having partition walls, the bending stress in the edge steel of the partition was seriously high and it finally failed by tension. This effect should be taken into consideration and sufficient steel inserted at the edge of the walls. The frame having a construction joint at the base of the wall failed by tension in the vertical steel at the edge. The wall itself was strong enough to stand a high lateral load. It is advisable to add short dowel bars to produce more strength.

7. At the end of a day it is often necessary to make a construction joint in the center of a beam span. Tests were made with two monolithic beams and with two others having a vertical construction joint at the center. Under low load a crack was developed along each of the construction joints and extended rapidly along these joints. There was no difference in the resistance and deflection of the monolithic beams and the beams with joints. These four beams were tested with repeated vertical loads and showed very high elasticity. From these tests it is concluded that a construction joint in the beam is not objectionable if properly built.

Careful Finishing Gives Unusually Smooth Concrete Pavement

Repeated Floating and Checking Result in California Highway Surface With 4.4-In. Roughometer Reading

CAREFUL inspection, favorable construction conditions and notable care in finishing secured the remarkable roughometer (vialog) reading of 4.4 in. per mile on a section of concrete paving built last year between Santa Ana and Anaheim, Calif. The work consisted of about 5 miles of 56-ft. pavement which included on each side of the 40-ft. roadway section an 8-ft. strip 5 in. thick for parking and public utility conduit construction. The construction required the removal of an old 18-ft. concrete pavement laid in 1913 and subsequently topped with asphalt. The 8-ft. public utility sections at the sides were poured first and are not considered from the standpoint of smoothness determination.

For various reasons, particularly the problem of han-

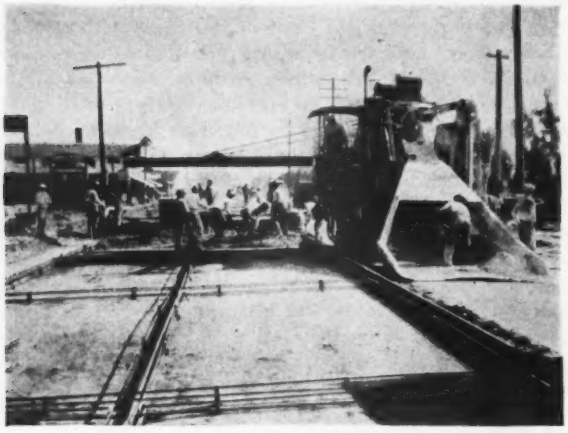


FIG. 1—POURING OPERATIONS ON A 20-FT. STRIP
Reinforcing bars around 20-ft. panels, steel side forms and weakened plane joints along the center line are shown.

dling traffic, it was decided to pour the roadway in two 20-ft. strips rather than in the standard 10-ft. widths. The cross-section of each 20-ft. slab was equivalent to two 10-ft. standard 9-7-9-in. slabs, and a weakened plane joint was provided down the center. The lower part of this weakened plane was secured by setting a 1x4-in. redwood board on edge on the subgrade along the center line. Reinforcing bars were placed around each panel, 20 ft. long by 10 ft. wide, according to standard design. Steel side forms, providing a firm track for the finishing machine, were used and were considered to have been an important factor in securing the record smoothness. The various preparations prior to pouring are shown in Fig. 1. Concrete was poured on the 20-ft. strip in the usual manner and the slab was ready for the various finishing operations which, in their proper sequence, were as follows:

1. A standard finishing machine spanning the 20-ft. width of paving followed directly behind the pouring and gave the surface a preliminary finish.

2. The surface was worked from bridges with a heavy 18-ft. longitudinal float and then by long-handled push floats. This longitudinal floating is shown in Fig. 2.

FIG. 2—LONGITUDINAL FLOATS FOLLOW FINISHING MACHINE
First heavy longitudinal float is immediately behind finishing machine, second heavy longitudinal float follows and final light float is in foreground.

3. A chalk line was struck along the center line and a steel T-bar 16 ft. long with a 2-in. vertical leg was pressed into the concrete to displace all coarse aggregate. This 2-in. groove along the center line, located directly above the redwood board on the subgrade, produced the upper portion of the weakened plane joint.

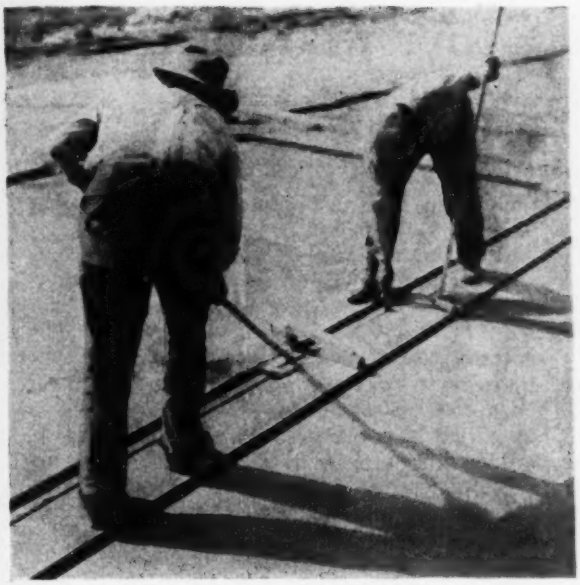
4. A second longitudinal floating followed, similar to the first. The time interval of about 75 minutes which elapsed between these two floatings, depending on how fast the concrete was setting, permitted most of the subsidence to take place. The second floating produced a fresh and live surface for finishing with a light longitudinal float. These steps filled the center-line depression made by the T-bar with water and surface material.

5. A chalk line again was struck along the center line and a board edger was used to clean the wet material out of the groove from a board walkway.

6. The walkway was lifted to one side and all marks of the edges and guide were rubbed out from along the center line with a whitewash brush.

7. The transverse joints spaced at 20-ft. intervals, including expansion joints every 60 ft., were finished with special care. Frequent checking with a straightedge during the shaping of the joint and rechecking and scraping by the inspector resulted in eliminating most of the unevenness at these points. At intervals of 60 ft., the expansion-joint fillers ½ in. thick were set in metal holders to insure a straight and vertical position in the slab. After the passage of the finishing machine, the holders were removed and the joints were carefully

FIG. 3—SWEEPING AND INSPECTING PRIOR TO PONDING
Note short distance between pouring and completed finish: ponding usually followed pouring within four hours.



FINISHERS AT WORK ON CONCRETE PAVEMENT

edged and tested for smoothness with an aluminum straight-edge.

At 20-ft. intervals between the expansion joints, vertical weakened plane joints were formed by inserting strips of steel ¼ in. thick and 2½ in. wide in the concrete. These steel strips were carefully cleaned and oiled before using. As soon as possible the joints were edged lightly and after the concrete had hardened sufficiently the strips were removed. The joints were then carefully edged again and the adjacent pavement was tested for smoothness. In using straight-edges, the concrete surface was considered unsatisfactory if any light could be seen under the straight-edge.

8. Joints were poured with asphalt to about three-fourths of their depth. The entire surface was swept free of loose material, tested with straight-edges and ponding followed within about four hours after pouring.

Among the important steps contributing to the record finish were the steel side forms, the use of two separate longitudinal floating operations to permit subsidence in the concrete before the second floating and the care in finishing the transverse joints. In addition, the 20-ft. width of pour, cutting the daily footage common to 10-ft. strips in half, resulted in less moving and better work by the finishers. The results obtained were made possible by competent inspection, with a fine spirit of cooperation on the part of the contractor's forces.

The work was under the supervision of S. V. Cortelyou, district engineer, reporting to C. H. Purcell, state highway engineer, and C. S. Pope, construction engineer for the division of highways. The resident engineer in charge of inspection was C. N. Ainley. The Griffith Co., of Los Angeles, was the contractor.

The Editor Afield—

Seen in the Pittsburgh District

Allegheny County Road and Bridge Work Keeps Contractors Busy—County Officials Foster Public Relations

WORK for Allegheny County occupies many Pittsburgh contractors; four high-speed boulevards, totaling 16 miles in length, are under construction. John F. Casey, of Pittsburgh, is applying his long railroad-construction experience to building the Allegheny River and Saw Mill Run boulevards. The Moss Side Boulevard, with 10 per cent grades through the hills of the eastern end of the county, is being built by R. H. Cunningham & Sons, well known in Pennsylvania highway circles. The Vang Construction Co. and Booth & Flinn, both oldtimers around here are sharing the 5½-mile Ohio River Boulevard. Several beautiful concrete-arch bridges are being built on this highway.

Foundations are practically completed and steel erection is under way on the long McKees Rocks bridge across the Ohio River just above Neville Island. The Dravo Contracting Co. did the substructure work, and the Fort Pitt Bridge Co. is erecting the steel. The main span of this bridge is a steel arch 800 ft. long.

The Foundation Co. is at work on the substructure of the new West End bridge, to be built across the Ohio a short distance below the convergence of the Monongahela and Allegheny rivers. This bridge will have a tied steel arch of 780 ft. for the main span, reported to be the longest span of its kind yet built. Contract for the superstructure has not yet been let.

Booth & Flinn have recently been awarded the contract for the Westinghouse Memorial bridge, a reinforced-concrete multiple-arch structure to be built across Turtle Creek valley. The total lengh of the bridge will be 1,500 ft., with a center span of 460 ft. The roadway will be more than 200 ft. above the valley at one point.

Bids will soon be called for on the proposed South Tenth St. bridge across the Monongahela. This will be a wire-cable suspension bridge with a main span of 725 ft.

When the cornerstone for the new $2,000,000 engineering laboratory of the Westinghouse Electric & Mfg. Co. was laid recently, company officials who carried on the operation were in another building several hundred feet away. Movements of a miniature crane, operated by hand, were transmitted by means of photo-electric cells to a full-size crane which actually set the cornerstone in place. The ceremony was a double success. It not only demonstrated the effectiveness of remote control of equipment but it also permitted the cornerstone to be laid in a typical Pittsburgh downpour of rain without inconvenience.

The idea has possibilities. If, in the near or distant future, you should drop into a contractor's office and find him digging away at a pile of dirt in the corner with a toy shovel, don't pass hasty judgment; he may be directing a steam shovel out in a cut several miles away. And you will probably find a television screen on the office wall showing how things are going out on the job.

The department of public works of Allegheny County believes in telling the public what is going on in county construction work and how it is being done. Movies are made of construction work under way, and these are shown at various public meetings, Chamber of Commerce luncheons and at other suitable gatherings. The department finds that the layman is intensely interested in the work.

Cement, Concrete and Other Materials at the A.S.T.M. Meeting

Reorganization of Cement Committee and Comprehensive Report of Concrete Committee Are High Spots—Development Recorded in Brick, Gypsum, Slate, Timber and Paint

LAST week, in the first half of our report of the American Society for Testing Materials' meeting at Atlantic City, papers and reports relating to metals were covered. This second half of the report is devoted to cement, concrete and other materials.

Cement

Committee Report—An important internal change in the society was marked by the complete reorganization of committee C-1 on cement. Under the new set-up there will be several subcommittees, each concerned with a particular type of cement and each studying special problems by means of small groups appointed only for short periods. The reorganization was predicated largely upon the fact that committee C-1 is at present concerned with four types of cement—standard portland, high-early-strength portland, natural and masonry—and in all probability must give attention soon to other types, among them high-alumina and a slag puzzolanic cement.

New Acceptance Test—Three papers were presented on the general subject of cement. One by J. R. Dwyer and P. H. Bates (Bureau of Standards) on "The Relation Between the Strengths of Cements Developed by Mortar Specimens and Concrete Specimens" reported data from tests made over a considerable range in time. The specimens used were standard sand mortar briquets, 2-in. mortar cubes, 2x4-in. mortar cylinders and standard 6x12-in. concrete cylinders. Results showed that ratios of mortar to concrete strengths developed by different cements varied with age, with kind of mortar specimens, and with kind, grading and proportioning of the concrete. In general, the tests were not satisfactory in showing that present methods of cement mortar test provide results indicative of the strength behavior of the same cements when used in concretes. In discussion, it was pointed out that tests made at the laboratories of the Lehigh Portland Cement Co. indicate a similar conclusion—namely, that cements bear different strength relationships one to another at different water-cement ratios, and that aggregate and sand proportions and qualities affect concrete strengths to such an extent that mortar tests are not indicative of a cement's value in concrete.

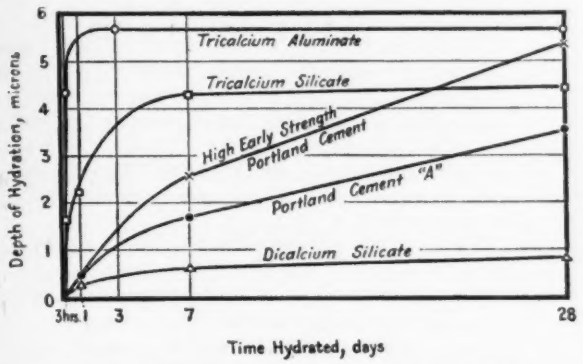
This discussion of the Lehigh company's test work brought out some promising results in connection with using plastic mortar cubes, tested in compression as a substitute for the present tensile test. The agreement between compressive strengths of plastic mortar cubes and standard concrete compression cylinders, using the same water-cement ratios, was found to be as close as 2 per cent between ages of four months and one year. Previous to four months the plastic mortar specimens were about 10 per cent under the concrete specimens. Further, the age-strength curves of concrete and plastic mortar specimens made from four cements were closely identical in form and location, while the graph of briquets using the same cements was a straight line, located considerably beneath the curves. H. F. Gonnerman, of the Portland Cement Association, told of some similar tests using eight cements with three-water-cement ratios for each, in which mortar and concrete strengths were closely similar.

The same subject—development of a new acceptance test for cements—was also reported upon by committee C-1 in an outline of the investigation made on 2-in. plastic mortar cube compression specimens and 1 : 3 standard sand briquets by its subcommittee on strength. In a series of tests carried out by ten laboratories using four different cements there was a much greater spread in briquet and cube strength between the different laboratories than within a given laboratory.

Comparison of Fourteen Portland Cements—C. H. Scholer and L. H. Koenitzer, of the Kansas State Agricultural College, presented a report on a study of fourteen brands of standard portland cement, which in a measure supplemented a similar study reported on 32 brands of cement by committee C-1 at the 1928 meeting of the society. The Kansas results indicated: (1) marked variation in the consistency of the standard mortars made by using the quantity of water indicated by normal consistency; (2) that maximum density of a mortar does not always correspond to maximum strength; (3) that mortar tension and compression tests of the cements show uniformly satisfactory results; (4) that flexural strengths of concrete made with the cements are fairly uniform while the compressive strengths show a wide variation; (5) that slump and flow tests of the mortar and concrete show generally good agreement; and (6) that the chief variation in the brands of cement is their sensitivity to small variation in water content, some showing little loss in strength with added water while others showed a rapid decline. Those discussing the paper were inclined to blame certain test methods used for the erratic results of the concrete compression tests.

F. O. Anderegg, of the Mellon Institute, reported further on his studies on the rate of hydration of cement, initially reported at the meeting last year. The method used was to separate different particles of the ground clinker by air sorting, hydrate them and determine the linear depth of hydration. Standard portland cement particles, 15 to 30 microns in diameter, hydrate to a depth of 7.2 microns at nine months as compared with 3.54 at one month and 5.12 at three months. At twelve months hydration is practically complete.

To the original tests there were added during the past year samples of tricalcium aluminate, tricalcium silicate and dicalcium silicate, and these minerals were individually subjected to a similar hydration test. The results are shown in the accompanying illustration, where the rate of hydration of the minerals is compared with a standard and a high-early-strength portland cement. The slow rate of hydration following rapid hydration during early ages was explained by Dr. Anderegg as being caused by the early formation of a gel around each cement or mineral particle which serves to retard entrance of the water. Another apparent conclusion,



RATE OF HYDRATION OF CEMENT AND SOME CONSTITUENT MINERALS
Determined by Anderegg at Mellon Institute, Pittsburgh

based on the fact that flour hydrated very rapidly, is that too fine grinding requires an excess of water.

In discussion Nathan C. Johnson expressed the belief that Dr. Anderegg's work will show that too fine grinding of cement, as for instance in current high-early-strength portlands, is detrimental rather than helpful. The demand for speed and early strength, in Mr. Johnson's opinion, is ill advised. Dr. L. T. Work, of Columbia University, reported that some of his investigations had shown that coarse and fine cement from the same clinker had the same hydration characteristics at one year, but that there was considerable difference in strength between the two.

Concrete

In the concrete session, committee C-9, on concrete and concrete aggregates, presented a voluminous report including numerous subcommittee reports on important subjects in the field of concrete testing.

Light-Weight Concrete—A paper, "Tests of Plain and Reinforced Haydite Concrete," by F. E. Richart and V. P. Jensen, of the University of Illinois, presented data on the structural properties of poured Haydite (burnt-shale aggregate) concrete. Mixtures used included concrete made with fine and coarse Haydite, natural sand and coarse Haydite, and, for comparison, sand and gravel or broken limestones. Gravel and Haydite concrete were found to have approximately the same relation between water-cement ratio and compressive strength. However, Haydite concrete required greater water-cement ratios for the same mixes and equal slumps; these mixes generally showed lower strength than those with gravel aggregates. The modulus of elasticity of Haydite concrete is low; for mixes using fine and coarse Haydite aggregate, 1,410,000 lb. per square inch; for mixes using natural sand and coarse Haydite, 2,230,000 lb. per square inch, both based on 28-day tests of 6x12-in. cylinders. The weight per cubic foot varied from 93 to 126 lb. The ratio of bond resistance to compressive strength at the age of 28 days was essentially the same for like mixes of gravel and Haydite concrete.

Workability—W. F. Purrington and Harold C. Loring, of the New Hampshire highway department, who presented a paper at the 1928 meeting of the society on the determination of workability by measuring the power consumed in mixing, amplified these studies in a new paper describing a series of tests using fifteen cements and a more refined apparatus. The power consumption curves showed a stepped outline, rising during the first four minutes of mixing followed by about a 50 per cent falling off from the peak and then a constant consumption of power up to ten minutes of mixing.

In discussion, E. C. Shuman, of the Portland Cement Association, described a somewhat similar equipment, which he termed a consistency indicator, that is being developed by the Koehring Co. in the hope of successfully adapting it as an attachment to its concrete mixers. Briefly, the apparatus, as so far developed, consists of a bar supporting a flat plate which is placed in the drum of the mixer and supported outside of the discharge end. Measurement of the impact of the mixed concrete on this bar gives some indication of the consistency of the mix. Whether the apparatus will measure workability or not was not considered important by Mr. Shuman, if it can be developed to aid in producing batch after batch of concrete that is uniformly mixed. Prof. Ira L. Collier, of the University of Washington, showed some slides of a similar apparatus that has been developed by L. A. Perry, of the Pioneer Sand & Gravel Co., which is being used successfully in a large ready-mixed concrete plant in Seattle.

Flow of Concrete Under Stress—A research report on 215 concrete cylinders whose deformation due to sustained stress has been studied over a considerable period of time, was presented by R. E. Davis and H. E. Davis, of the University of California. The specimens were initially stressed in a testing machine, and this stress was maintained by means of one or more car springs held in compression by a system of rods and plates. The specimens could be moved about and into specially insulated rooms where the temperature did not vary more than 1 deg. F. from a standard nor the humidity more than 1 per cent. The following principal conclusions appear to be justified: (1) The flow of concrete is greater for a lean mix than for a rich one. (2) For the same richness of mix the flow is greater in a concrete for which the aggregate contains a large amount of fines. Such a mixture would of course have a relatively higher water-cement ratio. (3) Limestone concrete flows the least, sandstone and basalt concretes the most, while granite and quartz concretes exhibit flows of intermediate magnitude. (4) Flow is materially influenced by moisture conditions, rising as humidity decreases. (5) The greater the age at the time of applying the sustained load the less the flow, while the higher the sustained stress the larger the flow. (6) Compressive reinforcement acts materially to reduce both flow and shrinkage. (7) The increase of stress in the steel during the period of flow is large—for instance, being increased from 5,600 lb. per square inch at the beginning of the period of sustained load to 25,800 lb. per square inch after eight months. About one-half of this was due to shrinkage and one-half due to flow.

Volume Change of Concrete—Prof. E. R. Dawley and Prof. C. H. Scholer, Kansas State Agricultural College, described an investigation of volume change in 6x4-in. concrete beams 2 ft. long. The maximum expansion, recorded after about 24 hours, was 0.02 per cent. Contraction began immediately, but not until after about 24 days did the specimens reach their original gage length. Shrinkage then continued at a fairly normal rate. When leaky forms were used, the initial movement was a contraction. Portland cement showed a greater constancy of volume than high-early-strength cement. The volume change of the beams was very little affected either by type or grading of aggregate or by richness of mix.

To the report of committee C-9 on concrete and concrete aggregate were appended a number of reports by members of the committee on timely testing and research subjects. The conclusions of these reports contain some valuable information.

Specimen Capping—The testing of concrete cylinders using a confined sand cushion was described by D. D. McGuire, National Sand and Gravel Association, in a report of an investigation made in the research laboratories of the Tennessee highway department. In the test the tops of the cylinders were capped with a stiff cement paste, while the bottoms were placed in steel rings of various diameters filled with a sand layer to a depth of ¾ to 1 in. A ring in excess of 6.3 in. inside diameter was not satisfactory. However, with a ring of this size or smaller, cylinders show strengths equal to those tested with plaster of paris and portland cement capping.

P. J. Freeman, of Pittsburgh, described a method of capping using a compound consisting of sulphur and some such material as fireclay or limestone dust, combined in equal amounts, which is especially useful for concrete cores and cylinders with irregular ends. The material cools quickly and the specimen may be tested almost immediately. (See *Engineering News-Record*, Nov. 22, 1928, p. 777.)

Testing Cylinders of Large-Aggregate Concrete—F. R. McMillan, Portland Cement Association, outlined a procedure for testing concrete in which the aggregate is more than one-fourth the diameter of the cylinders. Briefly, these large aggregates are removed, and if necessary the original consistency of the mix is restored by adding coarse aggregate of the same kind but containing no pieces larger than one-fourth the diameter of the specimen. Specimens so formed develop the strength of the original mass.

Abrasion of Aggregates—F. H. Jackson, of the Bureau of Public Roads, presented an analysis of all available data showing the relations between the strength and resistance to wear of crushed stone and gravel concrete and coarse aggregates. He concluded: (1) that within the ranges of abrasion loss studied (up to 16 per cent for crushed stone and 28 per cent for gravel) the crushing strength of concrete is not affected by the quality of the coarse aggregate as measured by the standard Deval abrasion test; and (2) that within the range of the abrasion losses studied, the resistance of concrete to wear as measured by the Talbot-Jones wear test is not affected by abrasion loss on aggregate.

Dust-Coated Stone—A. T. Golbeck, National Crushed Stone Association, reported a study of the use of dust-coated stone on concrete specimens tested at the age of one year. The investigation was supplementary to one reported last year involving 28-day tests. The general conclusion of the one-year tests is practically the same as for the 28-day tests—namely, that stone dust up to 5.7 per cent of the weight of stone used does not seem to have any particular effect on the properties of the concrete. However, certain types of stone to which the dust clings tenaciously, should be avoided.

Abrasion Loss on Blast-Furnace Slag—A comprehensive report on abrasion loss of blast-furnace slag, by Fred Hubbard (Standard Slag Co.) led to the conclusion "that the unit weight of blast-furnace slag can be checked by various laboratories with a reasonable degree of accuracy, while the abrasion test does not produce uniform and accurate test results."

Durability of Concrete—After an inspection tour of 1,673 miles in which approximately 30 structures (or whole developments, such as Montreal harbor) were examined, the subcommittee under the chairmanship of Ephrem Viens stated that all of the defects observed on these structures, extending from Toronto to Quebec City in the Lake St. John district in Canada, could have been avoided by proper attention to four factors: quality of aggregate, quantity of cement, consistency of the mix, and method of placing.

Other Reports—Of the other subcommittee reports on concrete and concrete aggregates may be mentioned one by C. H. Scholer (Kansas State Agricultural College) describing a band-type extensometer for Poisson's ratio determinations, and a digest of test data on Poisson's ratio for concrete presented by F. E. Richart and N. H. Roy, of the University of Illinois. The various investigations reported showed values of Poisson's ratio varying from 0.08 to 0.28, with an average somewhere around 0.14. Another useful reference report was made by Raymond E. Davis, of the University of California, summarizing the investigations of volume changes in cements, mortars and concretes produced by causes other than stress, namely, variations in temperature and moisture conditions.

Drain Pipe and Sulphate Actions

The report of committee C-6 on drain tile told of three investigations that are under way by the Iowa Engineering Experiment Station, by the U. S. Bureau of Public Roads and by the Portland Cement Association. The Iowa tests by Dean Marston have recently yielded the conclusion that "with a rigid conduit, the pressures are very high at the top and bottom, and so small as to be negligible at the sides. When a flexible pipe is laid in an embankment the distribution of pressures for very low fills is similar to that for rigid pipe, but as the fill is raised and has opportunity for settlement, the pipe deforms and the pressures tend to become more nearly uniform around the pipe."

The tests of the Bureau of Public Roads, relative to durability of drain tile under exposure to various soil conditions, at University Farm, St. Paul, Minn., indicate that concrete of poor quality will not withstand the action of even low-acid peats. Conclusions as to the durability of different types of the better concrete are not yet available. At another session Dalton G. Miller, senior drainage engineer of the bureau, stationed at the University of Minnesota, gave further data relative to the same investigation, which involves 12,000 2x4-in. concrete cylinders, cured in water vapor at temperatures between 100 and 350 deg. F. and then tested as to strength and resistance to sulphate waters. The results indicate that from the standpoint of strength nothing is gained by curing concrete in water vapor at a temperature much above 155 deg. F., and little is gained, even at this temperature, by prolonging the curing period beyond 48 hours. From the standpoint of resistance to sulphate water, nothing is gained by increasing the temperature of the water vapor in which concrete is cured until 212 deg. F. is reached. Between 212 and 260 deg. F. increased resistance follows increase in curing temperature. For a temperature of 212 deg. F. concrete increases in resistance with increase of the curing period up to six days. The tests are continuing.

The field studies of the Portland Cement Association, begun in 1921, on concrete cylinders exposed to sulphate waters and soils at Montrose, Colo., and Medicine Lake, S. D., reached the seven-year inspection stage in

the summer of 1928, and the results were published in the report of the association's director of research in November, 1928. Briefly, the stronger the concrete (28-day tests) the better it resisted sulphate attack. Also, the resistance of the concrete was directly proportional to the amount of cement used. Integral compounds were found not to be effective, while boiled linseed oil, asphalt, tar and pitch, used as surface coatings, gave favorable results, with the linseed oil proving to be best.

Other Materials

Brick—A paper by L. A. Palmer and J. V. Hall, research associates of the American Face Brick Association, presented results of freezing and thawing tests on clay and shale face brick which tend to corroborate the general belief that absorption is not a reliable index of weather resistance. Variability of clays and of manufacturing processes were cited as the chief reasons why this is so.

Slate—Accelerated tests on the color effects of acids and alkalis on slate reported by committee D-16 on slate showed that alkalis produce no marked effect and that hydro-chloric and sulphuric acids act very slowly but produce a delicate "rusting."

Timber—Committee C-5 on fire tests of materials for construction presented a proposed method of test for fire-retardant treated wood involving the new fire-tube apparatus of the U. S. Forest Products Laboratory.

An instrument which expresses in terms of moisture content a measurement of the electrical resistance of wood was described by M. E. Dunlap, chairman of the subcommittee on moisture content of timber.

Gypsum—Interesting results of a two-year investigation of the properties of gypsum fiber concrete, a combination of wood shavings, gypsum and water, used for both precast and poured-in-place floors and roofs were reported. Two types of gypsum fiber concrete were considered—namely, one containing 3 per cent by weight or less of wood shavings and the other containing approximately 12½ per cent. In addition, a few 10 per cent mixtures were tested. Consistencies of 50, 60, 70 and 80 per cent water were used. Some of the compressive strength results were as follows: 3 per cent chips, 800 to 1,300 lb. per square inch, the higher strengths corresponding to the drier mixes; 12½ per cent chips, 450 to 600 lb. per square inch. The modulus of rupture for 3 per cent chip mixtures varied from 210 to 310 lb. per square inch and for 12½ per cent chip mixtures from 110 to 170 lb. per square inch. The modulus of elasticity of 3 per cent chip mixtures ranged up to 580,000 lb. per square inch and of 12½ per cent mixtures from 200,000 to 300,000 lb. per square inch.

Paints—Measurement of hiding power was the major subject discussed at the paint session, a committee report and four papers being presented. A tentative working definition of hiding power was announced by committee D-1 as follows:

> The hiding power of the paint is measured by that quantity of a paint that must be applied to a given area of an impervious black and white background, the white portion of which has the brightness of 80 and the black less than 8 per cent, so as to bring the brightness over the black background to within 90 per cent of that over the white background, and shall be specified as wet or dry.

The committee reported that an investigation of tinting strength and hiding power by several laboratories using pigment samples and pigment-in-oil samples provided by the committee made possible the conclusion that (1) tinting strength is of considerable importance and that present methods of measurement are not satisfactory and that (2) the cryptometer gives satisfactory results for hiding power. Prof. A. H. Pfund, of Johns Hopkins University, who developed the cryptometer generally used, described a modification of it which he had recently developed to measure hiding power in conformity with the new definition. Professor Pfund also briefly described a precision cryptometer which he is developing to eliminate the personal equation now involved in determining the exact point at which the division line between the black and white background disappears. The instrument takes advantage of the sensitivity of the photo-electric cell, which indicates differences in intensities over the black and white areas by relative deflections of a galvanometer.

Aircraft Materials

The all-day session devoted to aircraft materials provided some information of rather broad applicability. For civil engineers engaged in structural steel or pipeline work, some of the data in a paper on corrosion-prevention methods in use in aircraft construction, by H. S. Rawdon, chief metallurgist, U. S. Bureau of Standards, may prove of value. For all structural steel parts, electroplating with zinc or cadmium is used, with a preference for cadmium. The navy requires that such treated parts shall withstand 200 hours of salt spray without breakdown. A more usual requirement is 100 hours. After plating, a coat of red oxide primer is used, followed by a finish coat. Closed steel tubular members are protected by filling with raw linseed oil at 160 deg. F. under slight pressure and allowing it to drain slowly through holes provided for the purpose. For open-end tubes a primer coat is used for protection. Before any coatings are applied cleaning is thoroughly done by sandblasting, by pickling in a hot acid solution followed by immersion in a weak alkaline bath, by a hot alkaline cleaning solution or grease solvent such as gasoline. Protection for aluminum consists of a 3 per cent solution of chromic acid applied by the anodic oxidation process, followed by a primer and finish coat.

The other papers of some interest were concerned with X-ray testing and photo-electric studies of airplane parts. Ancel St. John, consulting physicist, New York City, told how X-ray examinations of wood in England reveal splits caused by screws, show improperly glued joints and locate knots and rosin pockets. In the United States, X-ray examinations are used in light-metal casting manufacture, in determining the proper balancing of aluminum alloy propellers, in light-metal alloy ingot manufacture and in welded joint inspection. Photo-elastic studies of aircraft parts were discussed by Prof. T. H. Frost (Massachusetts Institute of Technology), who cited a model of the airship "Shenandoah," a box girder later changed into a model of a cantilever wing for a monoplane, a side panel of the fuselage of an airplane cabin, and a model landing gear, as having been subjected to the photo-electric method.

In a paper describing metal joint practice, T. Watson Downes, U. S. naval aircraft factory, Philadelphia, described the welding, brazing, soldering and riveting methods used. Because of its easy weldability, chrome-molybdenum steel is replacing straight carbon and chrome-vanadium steel. Nickel steel welding is not successful. Gas welding is satisfactory for aluminum and its alloys, using small welding torches. Brazing has its most extensive application in the manufacture of built-up fittings of sheet steel. Soldering is used where strength requirements and temperatures are low.

Heavy-Load Cableway Installation for Owyhee Dam

Headtower on Trucks Gives Radial Swing of 550 Ft. to 3-In. Cable of 1,300-Ft. Span—Tower Shuttled and 25-Ton Load Handled by Remote Control From Pilot House Overlooking the Work

A CABLEWAY 1,300 ft. long with a 3-in. track cable carrying an 8-cu.yd. bucket has been installed for the concreting operations on the Owyhee dam. The dam, which is part of an irrigation project of the U. S. Bureau of Reclamation, will require about 500,000 cu.yd. of concrete and the construction program calls for placing 1,000 cu.yd. per eight-hour shift. Its design was described in *Engineering News-Record*, April 28, 1928, p. 663, and a review of construction progress was published Aug. 15, 1929, p. 248.

The headtower track is 550 ft. long laid along an arc of 1,300-ft. radius, centering at the stationary tailtower. This range of movement permits concrete to be placed directly into all parts of the structure. The clearance is 30 ft. above the highest concrete.

Cables—The main 3-in. cable is of 6x37 plow steel construction with steel core. The button cable is a ¾-in. line with hemp core carrying eight buttons 130 ft. apart. The sag in these two lines is 5 per cent. The haul line is a ¾-in., 6x19 cable. Its speed is 300 to 500 ft. per minute, depending on motor adjustment.

The main function of the cableway will be to place concrete with 8-cu.yd. cylindrical buckets with conical outlets and hand-operated slide gates.

Head and Tail Towers—The traveling headtower is about 65 ft. high and weighs about 400 tons. The button line counterbalance is suspended by a heavy coil spring; by regulating the load the button line is made to parallel the main cable.

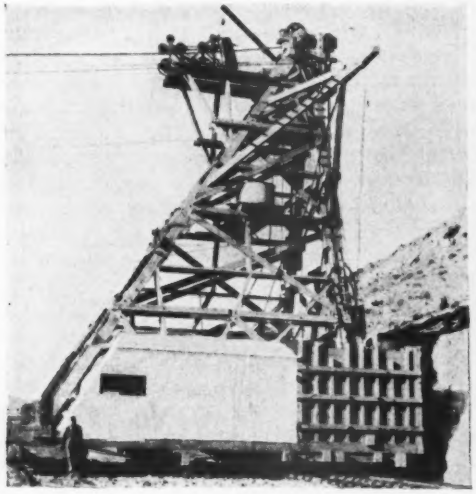
The main hoist, which has two 54-in. drums equipped with air-operated friction clutches and brakes, is driven by a 400-hp. motor. Two 15-hp. automatic compressors and a pair of receivers maintained at 50 lb. pressure provide the air supply. The equipment in the headtower also includes transformers to step down 2,300-volt current. The tower is moved on its tracks by a 75-hp. motor at a maximum speed of 200-ft. per minute by a drum in the tower engaging six turns of a three-part line fastened at both ends of the 550-ft. track.

The track consists of five lines of 100 rails. The trucks include seventeen pairs of 24-in. steel wheels, nine pairs being on the forward track and the remainder on the three rails that carry the heavy loads of the counterbalances.

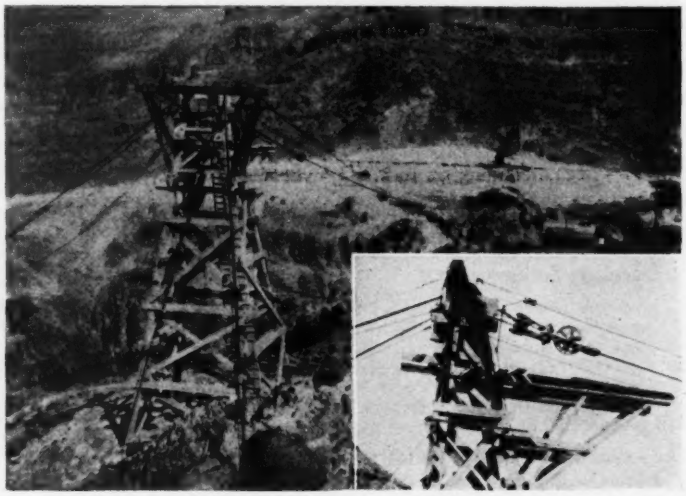
The tailtower is a bolted frame carrying an oak bearing block. Just before reaching the tailtower the main cable divides at a Y-yoke pull equalizer into two lines which pass over the bearing block near its outer ends and thence diverge to two concrete anchorages. This separation of the two cables beyond the tower provides for direct tension on the anchorages in extreme positions of the headtower.

Remote Control—Movement of the headtower will be required to place almost every batch of concrete. To accomplish this, a remote control panel has been mounted in a small "pilot house" which will be moved from one point of vantage to another as work progresses.

The Owyhee dam is being constructed by the General Construction Co., Seattle, Wash., J. A. McEachern president, J. W. Lawlor vice-president and general manager, and Ben Cook superintendent at the dam. The work as a whole is under the supervision of F. A. Banks, construction engineer, U. S. Bureau of Reclamation, Owyhee project, with F. Schlapkohl field engineer and C. A. Betts office engineer. The cableway was installed by the Lidgerwood Co.



A CLOSE VIEW OF THE HEADTOWER
Note the chair braces on the rails which carry the lateral thrust.



CABLEWAY SPAN FROM THE TAILTOWER
Note headtower track in background. The two main lines from tailtower diverge to anchorages not shown.

TAILTOWER END OF MAIN CABLE
Note Y-yoke arrangement of 3-in. main cable.

New Sludge-Removal Apparatus Developed at Milwaukee

Four Revolving Pipe Arms With Proportioned Multiple Inlets Designed to Minimize Interference With Sedimentation

By Darwin W. Townsend and James Brower
Assistant to Chief Engineer and Sewage-Plant Superintendent, Milwaukee Sewerage Commission, Milwaukee, Wis.

THE apparatus here described, while applicable to the collection and removal of sludges, slimes, pulps, tankage and other allied precipitates from settling tanks generally, was designed and developed for use in the activated-sludge process of sewage treatment. Briefly, it consists of four revolving hollow arms, each provided with numerous inlet tubes which increase in size and capacity from the outer to the inner end of the arm.

The basis of design of this sludge remover will be better understood after considering the role of sedimentation in the activated-sludge process and some causes of disturbance. Flocculated activated sludge is extremely sensitive to even slight disturbances, both during its precipitation and after it has deposited upon the bottom of settling tanks—its specific gravity being just slightly in excess of that necessary for precipitation. These disturbances have three main causes: (1) current created by the velocity of flow through the tank; (2) eddies resulting from the continuous water displacement of descending sludge particles—the degree of disturbance resulting from this precipitation-retarding cause is a direct function of the sludge concentration or percentage of sludge particles contained in the sewage liquor undergoing solids and water separation as shown in Fig. 1; (3) continuous collection of precipitated sludge from the entire area of a tank bottom, and its continuous removal from the tank.

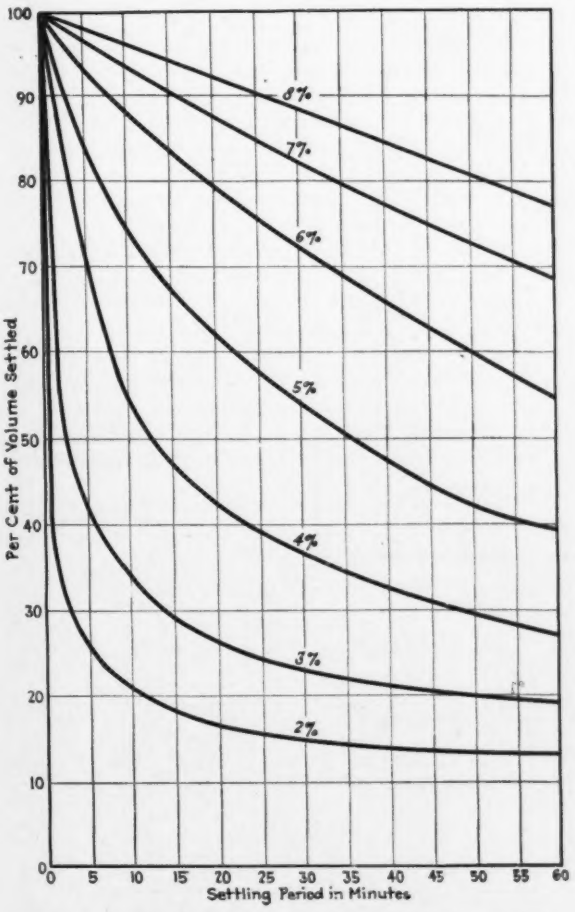


FIG. 1—SETTLING PERIODS FOR VARIOUS ACTIVATED-SLUDGE CONCENTRATIONS
Laboratory results under condition of quiescent sedimentation in 500-c.c. glass cylinders.

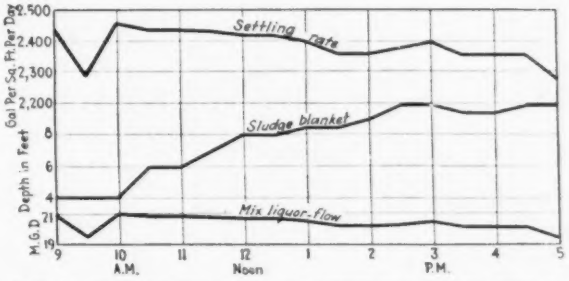


FIG. 2—OPERATING DATA OF SETTLING TANK, OCT. 2

While experience has indicated that these three major disturbance factors directly influence the amount and character of work which a settling tank can perform, it is recognized that the first two mentioned are inherent in a continuous-flow precipitation process and that the precipitate removal factor, while independent and apart from the actual precipitation process, must be considered from the standpoint of possible precipitation retardation.

In their work upon sedimentation-tank apparatus the writers sought to devise methods of minimizing the disturbance of sludge deposits so as to obtain the maximum possible efficiency, having in mind the sedimentation process as a whole. The sludge-removing apparatus finally developed consists of slowly revolving horizontal pipe arms equipped with multiple inlets, the flow of deposited liquid sludge being induced into and through the pipe arms and outlet pipe by the application of the hydrostatic-head differential principle. The adaptability of this particular type of apparatus, the action of which, simply expressed, is similar to that of a vacuum sweeper, to the work for which it was designed and developed, may be summarized as follows:

1. In one complete revolution the entire area of the tank bottom is covered, thus insuring no dead areas upon which sludge might remain and become septic.

2. Disturbances in the deposited-sludge zone are minimized because: (*a*) Deposited sludge is not moved from the area upon which it has deposited, except into the flared intake ends of the multiple inlets and thence

through the manifolds and out of the tank. (*b*) Removal of deposited sludge from the tank bottom and from the tank occurs entirely within the pipe arms and inlets and thus prevents the disturbance of the entire mass of deposited sludge. (*c*) The large combined area of the inlet-pipe openings reduces the revolving rate of travel to a minimum. (*d*) The inlet pipes and pipe headers being round, a partial streamline effect is produced, thus reducing the disturbing effect of the inlet pipes in their passage through the sludge zone.

3. The combined total inlet-pipe area — the individual pipe areas being quite small compared with the depth of overlying sludge deposits — permits a very high rate of sludge draw-off when necessary. This is important from the standpoint of reducing the possibility of vortex action and the resulting withdrawal of sludge in an incomplete state of precipitation.

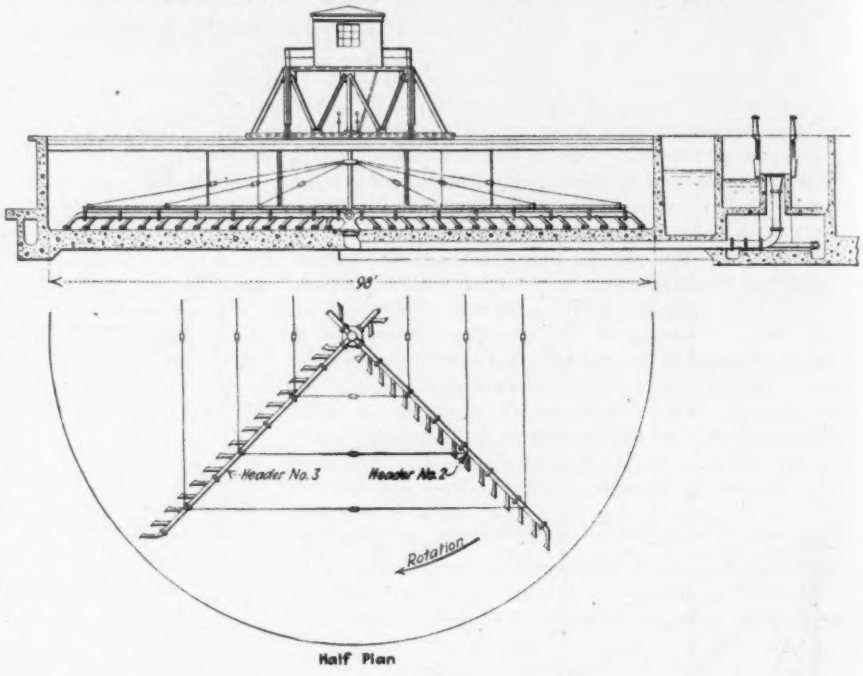
4. The number, size and spacing of pipe inlets and headers may be varied to accommodate specific conditions and specific classes of material precipitated.

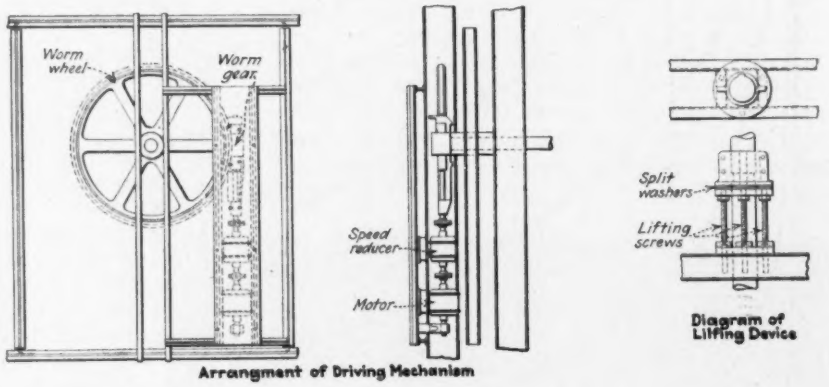
5. It is of particular interest to note that the design of the apparatus as a whole is susceptible to close theoretical, mathematical and hydraulic analysis, and that it can be so proportioned as to produce correct proportional rates of sludge withdrawal in the entire area over which it revolves, resulting in the maintenance of a substantially uniform depth of sludge zone. The inlet pipes on each header arm increase in diameter from the center of the tank toward its periphery, the diameter being computed upon the basis of a uniform velocity into and through each inlet pipe and upon the product of the proportional travel rate of the pipe arms and the proportional area covered.

6. Due to the fact that sludge movement and withdrawal in all parts of a tank occur entirely within pipes, the sludge-flow velocities and rate of removal can be such that the possibility of sludge becoming septic in a tank is remote. To any engineer familiar with the activated-sludge process of sewage treatment, the necessity for keeping sludge in circulation in the presence of air the maximum amount of time possible is clearly apparent.

7. In usual plant operation the liquid sludge withdrawn from sedimentation tanks varies in moisture content depending upon the rate of mixed-liquor flow through the tanks and the resultant detention or sludge concentration time. This moisture-content range is ordinarily between 98.5 and 99.5 per cent, the sludge being decidedly liquid and having a viscosity slightly greater than that of water.

Through the control features afforded by this appa-





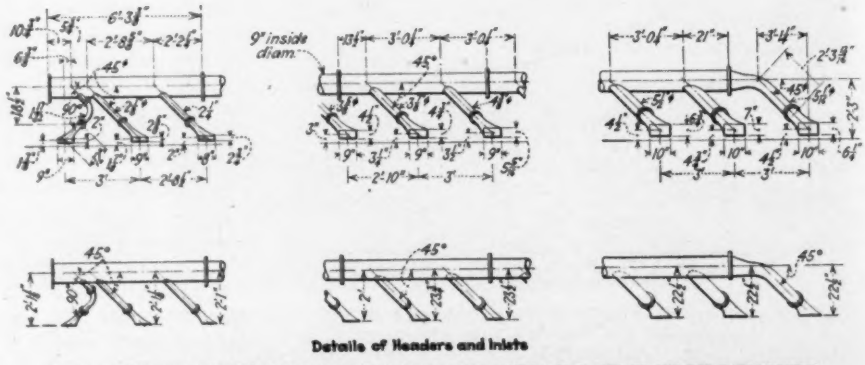


FIG. 3—PLAN, SECTIONAL ELEVATION AND DETAILS OF SLUDGE-REMOVER

ratus—namely, variable rate of arm travel and variable rate of sludge discharge, the concentration of the sludge withdrawn is susceptible to close regulation within the limits of detention time available.

To demonstrate the correctness of the principle of this particular type of sludge-removing apparatus, a tank 4 ft. 10 in. in diameter and 5½ ft. deep, containing a set of revolving pipe arms with flared inlets, was constructed and operated during the month of July, 1928. These tests indicated that activated liquors containing 0.4 per cent of suspended solids (dry basis) could be satisfactorily precipitated and removed from the tank at rates as high as 2,800 gal. per square foot of horizontal liquid surface per 24 hours, and with a total suspended-solids removal in excess of 90 per cent. Through glass windows located at close intervals in the vertical height of the tank, the sucking action of the revolving inlets and the effect of this action upon the control of the sludge-zone depth were observed and noted. The action observed was that the downward pull and entrance of the sludge into the inlet pipes accelerated the rate of precipitation and resultant sludge concentration in the immediate vicinity of the inlets.

After making the small-scale tests already described, a sludge remover of the same general type as that used in those tests was installed in one of the 98-ft. sedimentation units of the Milwaukee activated-sludge works in June, 1929, and has been in continuous and very satisfactory operation since that time. The pipe headers and inlet arms are constructed of cast aluminum, the pipe walls being ¼ in. thick, aluminum having been used because of its corrosion-resisting qualities and comparatively light weight. The tank is drained through slots into the main discharge pipe and thence through a blow-off valve to the main sewer. These slots, of which there are six, are located in the bottom of the four-way revolving cast-iron manifold. To drain the tank the entire sludge-removal apparatus is raised mechanically until the bottom edges of the slot are flush, or nearly so, with the top edge of the bronze wearing or seal ring in which the slotted projection revolves.

The bottom of the tank shown in Fig. 3 is perfectly flat, but it would be advisable in any subsequent installation to provide a slight pitch toward the tank center for the purpose of facilitating drainage when necessary.

The apparatus in use in the 98-ft. sedimentation unit was tested for more than a month under peak-flow conditions, with results shown by the accompanying table and curves (Fig. 2). The effluent was very clear throughout the test period, the suspended solids in the effluent being 14 p.p.m., representing better than 95 per cent total suspended-solids removal. With only one adjustment of the valves (9 a.m.) controlling the supply of activated mixed liquor to the sedimentation unit, the apparatus continued to function very satisfactorily with a gradually increasing depth of sludge zone. The ratio of returned activated sludge to raw sewage flow averaged about 34 per cent during the test period, and the solids concentration, as noted previously, was 0.45 per cent, both of which are considerably higher on the average than ordinarily exist in plant-operating practice. These extreme conditions were created and maintained for the purpose of observing the performance of the apparatus under unusual occurrences, or rather under abnormal plant manipulation which at times is necessitated. For lower ratios of returned sludge to raw sewage and the resulting lower suspended-solids concentration, greater tank capacity upon the basis of total mixed liquor precipitated may be expected.

The activated mixed liquors being supplied to the test tank were aërated at the low rate of 0.65 cu.ft. of air per gallon of sewage aërated, as against approximately 1 cu.ft. in usual plant operation. A significant fact which has been observed by the writers and, no doubt many times by others, is that decreasing the quantity of air in the aëration process tends to decrease sedimentation efficiency.

The device here considered, and upon which letters patent are pending, is known as the "Tow-Bro" (Townsend-Brower) sludge-removal apparatus.

OPERATING DATA OF SETTLING TANKS FOR OCT. 2, 1929
Solids Centrifuge

Time	Rate of Flow Mixed Liquor, M.G.D.	Per Sq.Ft. Per Day	Return Sludge No. 12	Mixed Liquor No. 12
9:00	20.9	2,440	1.23	.51
9:30	19.5	2,280	....	....
10:00	21.0	2,460	1.11	.49
10:30	20.9	2,440	....	....
11:00	20.9	2,440	1.11	.45
11:30	20.8	2,435	....	....
12:00	20.7	2,420	1.15	.45
12:30	20.7	2,420	....	....
1:00	20.5	2,400	1.15	.45
1:30	20.2	2,360	....	....
2:00	20.2	2,360	1.15	.41
2:30	20.3	2,380	....	....
3:00	20.5	2,400	1.23	.45
3:30	20.2	2,360	....	....
4:00	20.2	2,360	1.19	.43
4:30	20.2	2,360	....	....
5:00	19.5	2,280	1.15	.41
Avg.	20.4	2,385	1.16	.45
Max.	21.0	2,460	1.23	.51
Min.	19.5	2,280	1.11	.41

The sedimentation unit during the eight-hour test precipitated activated mixed liquor containing 0.45 per cent solids (dry basis) at a rate of 20.4 m.g.d., which corresponds to an average of 2,385 gal. per square foot of horizontal liquid surface per 24 hours. The maximum and minimum rates were 2,460 and 2,280 gal. per square foot.

Uniform Street Sanitation Standards

A set of uniform street sanitation standards are to be made available to city officials when the annual conference of the International Association of Street Sanitation Officials is held Oct. 9-11 in Louisville, Ky. At that time there will be presented a set of uniform standards for gaging and measuring municipal sanitation work. The standards represent the result of many months of investigation and study by a special committee of the association undertaken at the request of the National Committee on Municipal Standards. They have been developed with the aid and co-operation of the American Society of Civil Engineers, the American Society of Municipal Improvements, the University of Chicago and the Julius Rosenwald Fund. In the standards to be presented, the curb-mile is selected as the unit for measuring street-cleaning work. In applying it, cities will measure the miles that machines travel parallel to the curb, if machine cleaning is done. If the work is done by hand or by flushing, the length of the street will be multiplied by two to get the number of curb-miles. The ton will be the standard for measuring garbage and other refuse handled, except for those cities unable to weigh their loads, and for these provision is made for reckoning on a cubic yard basis. For catchbasin cleaning, the cubic yard will be the unit of measurement. After the standards have been formally adopted, the association plans to aid city officials in applying them and purposes to issue a manual which will serve as a guide. It is expected that by the use of these standards department heads can compare their operations with those in other cities.

From Job and Office

Hints That Cut Cost and Time for the Contractor and Engineer

Hydraulic Cartridge Wrecks Concrete Piers

By E. J. Brunner
Secretary Builders' and Traders' Exchange, Detroit, Mich.

BREAKING concrete by hydraulic pressure has been successfully employed in two recent operations in Detroit. Before the foundations for a screen house could be put in on a water-works park project, it was necessary to demolish a number of heavily reinforced piers each 6½x7x6 ft. After holes had been drilled for explosives, the mandate came to the Mark Hanna Co., general contractor, that no explosives would be allowed. As a result, the introduction of an English system for breaking concrete by applied hydraulic pressure was made on April 30.

The method consisted in boring in each pier to be demolished two holes each 4½ in. in diameter and a little more than 18 in. deep. After the boring was completed, a device weighing 90 lb. was carried by one man to the first pier, and part of this machine, a cylinder 4 in. in diameter and 18 in. deep, was inserted into one of the holes. This cylinder, made of heavy steel, had rams fitted in its sides which were to be thrust out under 3 to 5 tons pressure per square inch. The pressure was to be applied by a small pump which constituted the other part of this machine, which is sometimes called a "hydraulic cartridge."

With two thrusts or shot holes the pier was wrecked. An acetylene torch cut a few tangled reinforcement bars and the chunks were lifted out.

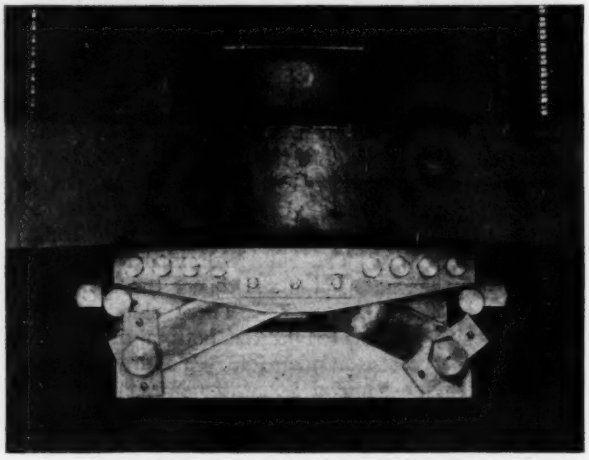
This was the first job undertaken by the Detroit Hydraulic Concrete Breaking Co. The second job is demolishing a reinforced-concrete tunnel directly under the main power plant of the Ford Motor Co., of Detroit. Naturally no explosive could be used and the job was progressing slowly with the employment of pneumatic tools and hand labor when the cartridge was put to work. One man on the job had in two days cut out a section 2½x½ ft. and 16 in. deep.

WRECKING A REINFORCED-CONCRETE PIER BY HYDRAULIC PRESSURE

Effect of Beam Deflection Simulated by Adjustable Testing Device

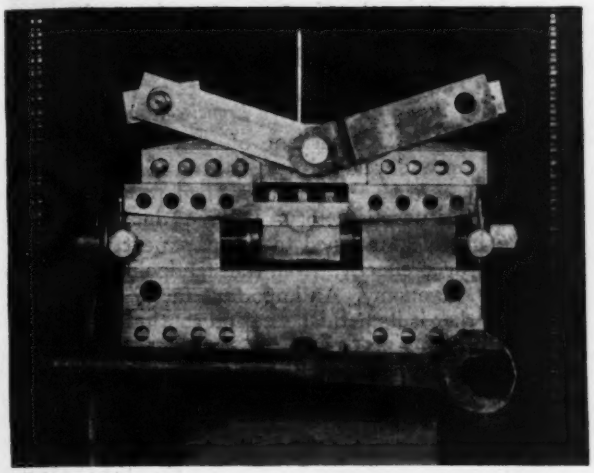
By J. R. Shank
Research Professor of Structural Engineering, Ohio State University

IN AN attempt to approximate the practical conditions imposed when a beam resting on a pilaster deflects under its load, a series of tests was recently conducted by the engineering experiment station of Ohio State University, in co-operation with the Structural Clay Tile Association. A device developed by the writer was used, by means of which the loading on the wall plate could be inclined in increments of slope corresponding to the increments in imposed load. In general, this apparatus consists of two heavy plates separated by four wedges, the position of the latter being controlled by two screws. The wedges bear on a flat surface on the lower plate, but the upper plate is slightly curved at the surfaces of contact. The screws are equipped at the center with collars which come into contact with blocks bolted to the upper plate. Turning the screws shifts all four wedges in the same direction, thus altering the angle between the plates. This angle is measured and controlled by four Ames dials, one at each corner. The device will withstand a load of 500,000 lb.



ADJUSTABLE TESTING HEAD READY FOR USE

When in use, the assembly is suspended from the crosshead of the testing machine. As the load is applied, changes in slope are made by turning the 2-in. nuts on the ends of the screws. Considerable force is required to move the wedges under fairly heavy loads, resulting in a tendency to horizontal motion in the lower plate. To restrain this movement, the two plates are connected by means of shear links equipped with eccentric adjusters;



HEAD PARTLY DISASSEMBLED, SHOWING MEANS OF ADJUSTMENT

the function of the latter being to take out all play in the device before it is brought into contact with a specimen.

In the particular series of tests for which the apparatus was developed, slopes were chosen which would be produced by a uniformly loaded 30-ft. simple steel beam with a depth of 16.77 in. The maximum slope used, 1:360, corresponded to a maximum unit-fiber stress of 18,000 lb. per square inch. The device is so designed that the center of the pin is 8.38 in. above the wall plate and on the neutral axis at the beam, making it possible to approximate the slight thrust which would result from the deflection of the beam as well as the slope of the loading. H. D. Foster, research engineer of the station, was associated with the writer in making the tests.

Inverting Rod Simplifies Leveling

By R. T. Brown
Assistant Professor, Department of Civil Engineering, University of Tennessee, Knoxville, Tenn.

WHEN taking levels or setting grades over an area which can be covered from one set-up of the instrument, considerable time and computation can be saved by reading elevations directly upon an inverted rod. During the resurfacing of the Shields-Watkins football field at the University of Tennessee this method was used to obtain elevations and set grade stakes, giving an excellent example of its application.

An ordinary 13-ft. Philadelphia rod was inverted and set on the benchmark used as a datum point or plane. This point was lower than any on the field. The inverted reading of 1.12 was recorded as the assumed elevation of the benchmark. Any point 1 ft. higher had an inverted reading of 2.12; a point 1.6 higher would read 2.72. Thus an inverted rod reading could be recorded directly as an elevation above the assumed datum, and so plotted on the profile and cross-section, eliminating much computation. When the level was used later to check the partly completed work, care was taken to make the set-up at a slightly higher elevation. The telescoping rod was then adjusted until, when held on the original benchmark, the same reading was secured as before. Any further readings with the rod clamped at this setting gave, as before, the correct elevation of the point without any computation.

When elevations are to be taken at points lower than the benchmark, the rod should be extended 2 or 3 ft. when assuming the datum, to avoid the necessity for negative readings. If some points are too high to be read from the first set-up of the instrument, a turn can be taken, the level set up at a higher elevation and the rod reset so that the level reads the elevation of the turn.

This same principle may be used to good advantage when setting form grades, except that the elevation of the starting benchmark is then fixed by previous levels, and the inverted rod must be extended until the level reads the feet, tenths and hundredths of the known elevation of the benchmark. Turns may be taken and the levels carried forward any desired distance as with the rod erect, or as with a self-computing rod.

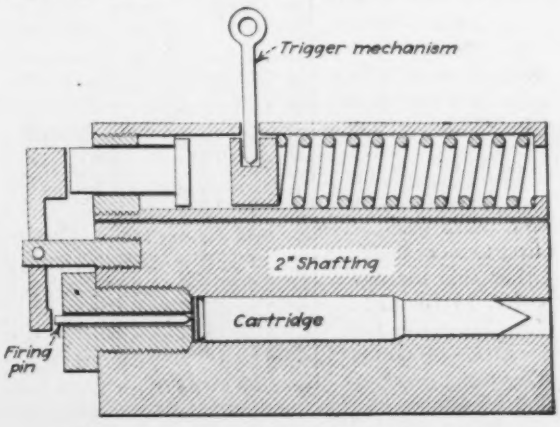
Short Gun Shoots Holes in Well Casing

By P. S. Malan
Chemist to J. & A. Buchanan, Ltd., Cape Town, South Africa

BY SHOOTING holes with a specially constructed gun through the sides of a 6-in. well casing, the yield of a well-water supply in Cape Town was increased from 286 to 1,600 gal. per hour. The casing had been driven through clay without water for 65 ft., then through 35 ft. of clay changing to soft shale, where most of the water was found, and finally, below the 100-ft. elevation, through hard shale with only small quantities of water in the crevices. As an air-lift system was used for raising the water, the depth was increased to 200 ft. to get correct submergence. The hole was then cased with a 6-in. screwed pipe, driven hard into the solid rock to a depth of 109 ft.

On starting operations a yield of only 286 gal. per hour was obtained, and it was obvious that the casing had been driven past the water-bearing strata and that the water could with difficulty percolate through the crevices in the rock. Efforts to pull the casing were unsuccessful. It was then decided that the yield could be increased by piercing holes in the casing between the 65- and 100-ft. levels.

The idea of exploding a charge of dynamite in the hole at the desired height was discarded as being too risky. One of the mechanics then conceived the ingenious idea of shooting holes through the casing by means of a specially designed gun, which, as the casing of the well had an internal diameter of only 6 in., was limited to an over-all length of not more than 5¾ in. A day's work on the lathe resulted in the construction of the gun illustrated, which was turned out of a piece of



GUN FOR SHOOTING HOLES IN WELL CASING

2-in. steel shafting and was designed to fire 9.3-mm. Mauser cartridges fitted with casehardened tool steel balls. After a preliminary test on a piece of casing sunk in the yard and filled with water, the gun was firmly mounted on a piece of 5-in. round cast iron, lowered into the hole and fired by means of a cord. A total of 33 holes was shot into the casing at 1-ft. intervals between the 65- and 100-ft. levels. As the standing water level in the borehole was 38 ft. from the surface, the gun operated under from 27 to 62 ft. of water. Because of the water pressure and the extremely short range (½ in.), the recoil was excessive, and it was necessary to repair the gun every five or six shots.

Reducing Minutes and Seconds to Parts of a Degree or Hour

By W. P. Warendorff
Assistant Engineer, Interborough Rapid Transit Co., New York City

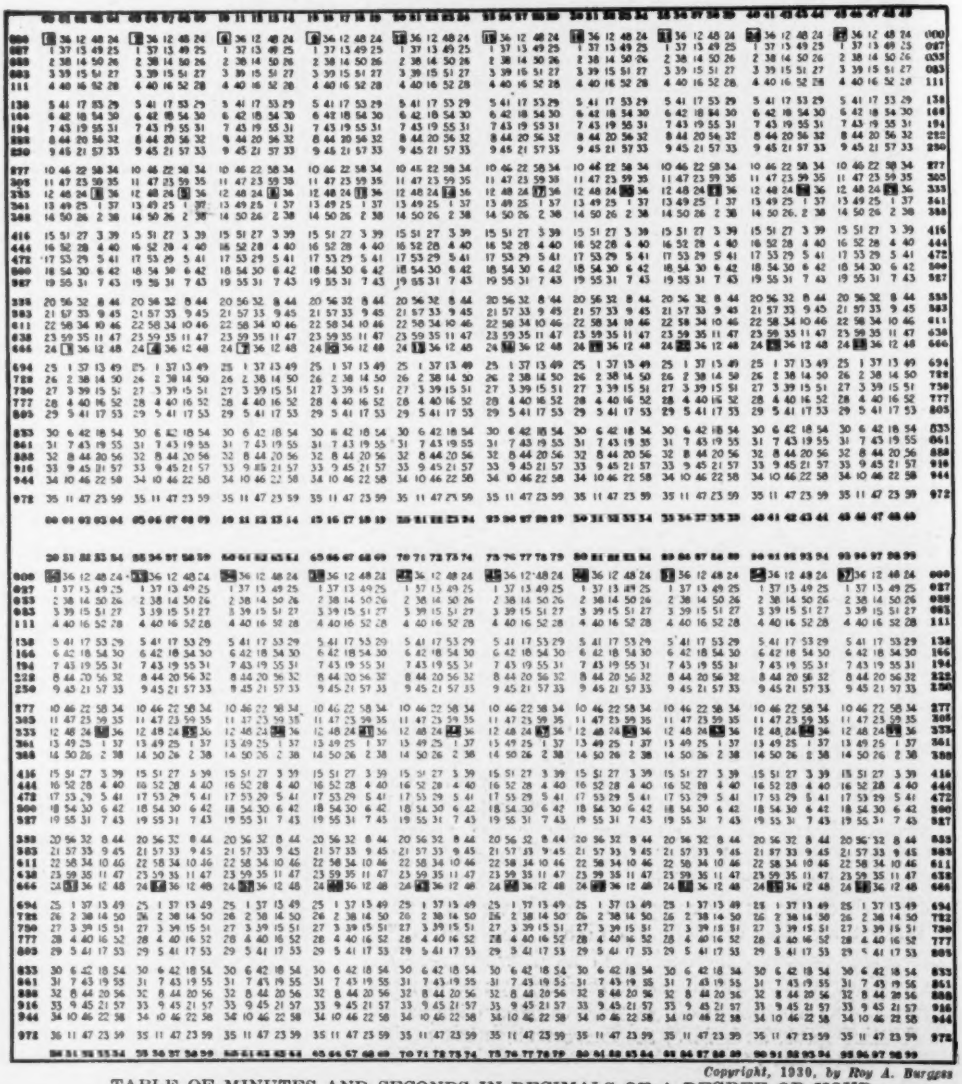
WHILE devising a table to convert minutes and seconds to decimals of a degree without the usual addition of the minute and second equivalent, an engineer noticed that at every 36 seconds the third, fourth, fifth and succeeding digits following the decimal point repeat themselves. This fact makes possible the table reproduced herewith, which has innumerable uses in engineering computation. In the table, reprinted by special permission of the copyright owner, minutes are designated by the heavy framed figures and seconds by the intermediate figures. The first two decimals in the result are read off at the top or bottom of the column, while the third, fourth and fifth decimals are obtained at the side. In all cases, the fifth or last decimal repeats indefinitely. For example, to convert 4 min. 54 sec. to decimals of a degree locate 54 sec. between the heavy framed figures 4 and 5. At the top of this column read 0.08 as the first two decimals; at either side the figures 166 to complete the fraction, giving the decimal 0.08166666+ as the equivalent of 4 min. 54 sec.

Effective Traffic-Lane Marker of Cast Aluminum Developed

By George D. Burr
City Traffic Engineer, San Francisco, Calif.

TRAFFIC-LANE markers of cast aluminum recently were developed for use on San Francisco streets after extensive experiments had proved various other materials unsatisfactory. Disks 4⅝ in. in diameter and 3/16 in. thick fastened to the pavement with steel pins have proved effective from the standpoints of traffic guidance and economy. An important factor in favor of the new marker is its permanence and continued visibility under traffic.

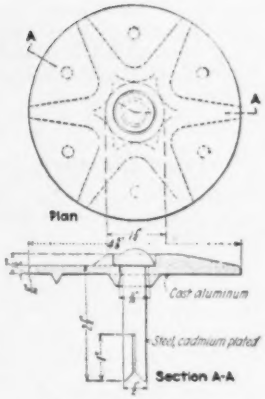
In common with other cities, San Francisco has experimented with various types of surface markers, including metal, rubber and several compositions, as well as lines consisting of inserts in the paving. Paint lines have been used extensively, but the fact that they become almost invisible when wet, combined with the cost of frequent repainting, makes this device unsatisfactory. Wide experience was gained in using about 200,000 of the common type of square galvanized-steel marker which has turned-down corners, to be driven into the pavement. With a purchase price of 7c., plus 7½c. for



Copyright, 1930, by Roy A. Burgess

TABLE OF MINUTES AND SECONDS IN DECIMALS OF A DEGREE OR HOUR

installation, the installed cost of this type of marker amounted to 14½c. per foot of transverse lines such as crosswalks where a 12-in. spacing was used. Longitudinal lines required a spacing of 18 in. with a corresponding cost of 11.6c. per linear foot. Experience indicated that heavy traffic wore off most of the zinc coating within a year or two, after which the visibility was so poor that painting was necessary along the line. With the beginning of painting over such an installation the cost of the original marker was practically lost.



ALUMINUM MARKER

As a result of the difficulties with the kinds of markers used, considerable experimental work was undertaken which led to the development of the new aluminum marker and a satisfactory method of fastening. Details of the disk and pin are shown in the accompanying drawing. One decided advantage of this new marker is the fact that increased traffic brightens rather than diminishes its visibility. Because of their greater visibility they may be spaced 18 in. on transverse lines and 36 to 60 in. on longitudinal lines. With a price of 13.45c., including pin, and a 6c. cost of installation, the cost of the marked line is less than 13c. per foot of transverse line and 4c. to 6½c. per foot of longitudinal line.

Installation on asphalt pavement consists of heating the surface locally with a torch and driving a pointed bar to a depth slightly less than the length of the pin. The hole is again heated with the torch and filled with hot asphalt until the material overflows to form approximately a 3-in. circle. The marker then is placed and the pin is driven. A special setting tool is used to drive the lugs on the under surface of the marker into the pavement, after which the pin is given a final driving. When the marker is used for concrete pavement, holes for the pins are drilled and filled with asphalt, which is also used to form a bed between the concrete and the marker. The pin, in either case, is split at the bottom and spreads in final driving which assists in making a firm anchorage.

Design of the marker and the method of installation were prepared by the writer. M. M. O'Shaughnessy is city engineer.

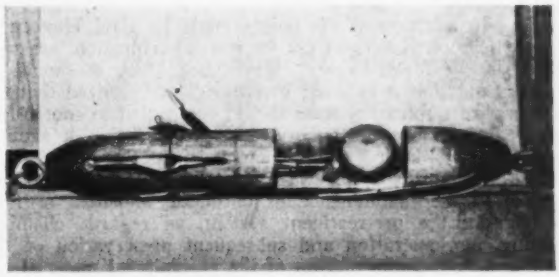
METHOD OF INSTALLING ALUMINUM MARKERS

Locating Branches on Small Sewers

By John W. Raymond, Jr.
Assistant Engineer, Metcalf & Eddy

On SOME recent sewer construction of 6- and 8-in. vitrified pipe, 5-in. Y and T branches were placed at intervals along the line and their positions recorded by the inspector. The connections to buildings were to be made after the sewer was completed and trench backfilled. Subsequently, on some of the work when excavations were made preparatory to connecting buildings, the branches could not be found at the points indicated by the inspector's records. Several unsuccessful attempts were made to locate the branches by a hook-and-spring device, and other arrangments attached to sewer rods. Finally a device was constructed especially for the purpose.

The larger proportion of the lines to be checked consisted of 6-in. pipe and the instrument was built primarily to fit that size. This contrivance was made so as to be hauled through the pipe from manhole to manhole and so equipped that a gong would ring when a branch was reached. It consisted of a cylindrical piece of wood 3 ft. long, 4½ in. in diameter, with blunt tapered



DEVICE FOR LOCATING BRANCHES IN SMALL PIPE LINES

ends. Upon it were mounted six triggers, each attached by a link to a collar free to slide on a rod through the long axis of the instrument. A single link was attached to the trip of a 3½-in. gong and secured to the collar. Each trigger was provided with a spiral tension spring to cause the trigger to press outward. When the contrivance is in the pipe the triggers are all held in by the inside surface of the pipe. As it is pulled along, the gong rings when one of the triggers snaps into the opening of a branch. The illustration shows the contrivance with the front end at the right and with one trigger extended as it would be at the opening of a branch. The other triggers are shown tied down.

Four 100-ft. steel tapes were fastened together and one end was secured to the rear of the contrivance. As the device was hauled through the line, an observer noted the distance at which the gong rang.

Six days' time was needed to check over 1½ miles of sewer. The crew consisted of two men to operate the contrivance and keep records and three to four laborers and a foreman for removing manhole covers, pushing rods through operating hydrants and standing guard at the manholes when open. In exploring 8-in. lines the same machine was used except that six wooden runners about 1 in. thick and 1½ in. wide were secured to the wooden frame of the instrument, spaced equally around the circumference between the triggers, and the links were lengthened to permit the triggers to extend farther out from the center.

Letters to the Editor

Engineering Pioneers

Sir—The article in *Engineering News-Record* of April 24 by Prof. James K. Finch, on "French Pioneers in Engineering," is at once so interesting and informative that to hint at criticism of it would seem to be almost ungracious. Yet the reiteration by Professor Finch of his opinion that early British engineering was merely a development of French engineering leads one to seek the source from which the latter developed. It will generally be admitted that the Roman Empire left its marks, in the form of roads, bridges, aqueducts, and harbor works, to a considerably greater degree on France and the neighboring countries bordering on the Mediterranean than on the island of Great Britain, a fact to which the quite remarkable achievement of the French engineers after the Renaissance, can surely be attributed. The work of the Romans is mentioned by Professor Finch in his article, but the relative emphasis which he places on the works of these several ages and peoples appears to be a little at variance with the facts, when viewed from a standpoint in which national matters are subservient to engineering considerations.

Cobalt, Ont., Canada, May 7, 1930. — Robert F. Legget, Civil Engineer.

Developments in Water-Purification Practice

Sir—In addition to the points made by Paul Hansen in his article on developments in water-purification practice, *Engineering News-Record*, May 22, p. 839, it should be pointed out that it is being increasingly recognized that the operator of a filtration plant should be enabled to control the physical functions of the pretreatment works in a manner as effective as he has at his command in declogging a rapid sand filter through backwashing. This desirable control relates to the maintenance of optimum velocities of flow throughout the pretreatment system, as regards chemical mixing, agglomeration and subsequent preservation of the floc, and final sedimentation of the precipitated material.

The use of mechanical mixing devices is deservedly gaining favor among designing engineers and operators of water-treatment plants. It is generally desirable to provide for decreasing mixing velocities, which may be obtained through the use of stirring mechanisms operated at corresponding speeds. In one of his recent installations the writer introduced an original design known as "spirovortex" mixing, wherein a controllable mixing velocity is maintained in the coagulation tanks by means of recirculation of a portion of the flow by pumping. Also results of experiments indicate the desirability in some cases of providing for chemical agitation as distinguished from mixing as such, to which the "streamflow" method of recirculation over a riffled surface is particularly well adapted.

Intermediate between the well-ordered mixing of coagulation and the semi-quiescence of sedimentation, there should be interposed a period of gentle stirring or streaming to produce agglomeration of the floc. This takes place at velocities ranging, for typical waters, from 0.1 to 0.15 ft. per second. The tank or channel capacity required for this period is more than offset by the resulting decreased sedimentation-basin size.

A new line of development, of particular interest to the sanitary engineer of the Pacific Coast, is the close interweaving of the functions of the water-purification plant with those of the sewage-treatment works that may be expected in the near future as a result of the definite program of research now undertaken in sewage reclamation for irrigation and industrial purposes. In addition to a comprehension of the intricate problems of complete sewage treatment, an intimate knowledge of the abilities and limitations of water purification is required of the designer, which will unquestionably evoke numerous ingenious modifications and improvements in design and operation. Of outstanding interest to the water and sewage-works profession is the work now begun by R. F. Goudey, of the Los Angeles department of water and power. It may now be predicted that it is possible to reclaim from sewage a water supply conforming to Treasury Department standards, at a total cost substantially less than that required to develop an equivalent quantity of water from distant, natural water sources.

San Francisco, Calif., June 10, 1930. — Harry N. Jenks, Consulting Sanitary Engineer.

Inclosed Masonry Standpipe at Lawrence, Mass.

Sir—In *Engineering News-Record* for June 13, 1929, p. 941, May 8 and 22, 1930, pp. 780, 863 and 867, references are made to water tanks and standpipes the appearance of which had been improved by masonry facing for exterior walls. These structures bring to mind a standpipe built at Lawrence, Mass., in 1895-96, when the writer was a member of the Lawrence water board. The following description is taken from the report of the board for the year 1897:

The masonry tower is octagonal in shape, and is built of brick and stone, the lowest 27 ft. being broken granite ashlar, above

INCLOSED HIGH SERVICE STANDPIPE, LAWRENCE, MASS.
Reproduced from the 1897 report of the Lawrence Water Board

which the facades are of faced brick, with granite trimmings. The shortest diameter is 33½ ft. The outside diameter of the steel standpipe is 30 ft. 1½ in. The thickness of the masonry walls at the bottom is 2 ft., and just below the top of the balcony it is 16 in., the walls battering on the outside and being plumb on the inside. The walls above the balcony floor are 1 ft. thick. The steel standpipe is 107 ft. high from the surface of the ground. A spiral stairway is contained inside the masonry tower and outside the steel standpipe. Between the ground and the balcony there are five landings. The balcony is above the top of the steel standpipe and is open to the weather. The top of the finial is 157 ft. above the ground. The total cost of the standpipe with masonry is $40,419, divided as follows:

Steel standpipe	$18,187
Masonry tower	21,719
Telemanometer	513
Total	$40,419

The total cost of the high service system built at that time is $70,000, which includes not only the standpipe but a high lift pump, considerable 16-in. pipe for service and minor fittings and appurtenances, as well as $2,000 for land.

Pittsburgh, Pa., May 24, 1930. — Morris Knowles.

News of the Week

Pasadena to Begin Construction of Pine Canyon Dam

The city of Pasadena, Calif., has announced that it expects to start at once on construction of the proposed Pine Canyon dam for its water-supply project. This decision followed the filing of the final reports on the dam site by Dr. F. L. Ransome, of the California Institute of Technology, consulting geologist for the city, and L. C. Hill, consulting engineer, both of whom reported favorably on the adequacy of the site for the proposed structure, which will be 295 ft. above streambed. The city last year voted $10,000,000 in bonds to finance the project.

Phoenix Votes in Favor of $3,442,000 Bond Issue

On June 25 the taxpayers of Phoenix, Ariz., voted about 2½ to 1 in favor of four municipal bond issues aggregating $3,442,000. The vote was a heavy one.

Two large construction projects are included in the bond issues. One is for the rehabilitation of the city water-supply system, for which bonds aggregating $2,364,000 were approved. The other is the construction of a modern sewage-disposal system for the city, for which bonds amounting to $817,000 were voted.

Two Michigan Earth Dams Fail

Small damage, $12,000 to $15,000, was incurred June 25 by the failure, due to overflow, of earth embankments at the end of concrete spillways in two dams, one above the other, on the Escanaba River, above Escanaba, Mich. The dams were fifteen to twenty years old and 18 and 30 ft. high. No other damage than to the dams themselves was sustained, although newspapers reported damage estimated at $1,000,000 due to flooded factory districts. J. B. Bedore is chief engineer for the Escanaba Paper Co., owner of the dams.

Wilmette to Have City Manager

In the election last spring the village of Wilmette, Ill., a town of 15,000, voted for trustees pledged to inaugurate the city manager system by ordinance. Such an ordinance was formally passed July 1 and the village president, E. E. Orner, together with two trustees, Ernest Cazel and W. W. De Berard, have been authorized to find a suitable candidate. No salary has been set for the position, but it is the desire to employ only an experienced city manager at from $7,000 to $8,000.

Voters in Chicago Approve Unification of Transit System

Single Company to Take Over Street Railways and Elevated Lines—New Subway Planned

BY AN overwhelmingly favorable vote (325,837 out of 382,527) Chicago citizens on July 1 approved the granting of a comprehensive indeterminate franchise empowering a new company to take over and operate all of the existing street car and elevated rapid transit lines. Involved from the engineering standpoint is the required construction by the company, within ten years, of extensions and betterments costing $200,000,000, of which $65,000,000 is to be spent within three years. Construction of a subway system by the city, with the traction fund and proceeds of special assessments, and other stipulations, were noted in the issue of *Engineering News-Record* for June 26, p. 1069.

R. F. Kelker, engineer for the city council transportation committee, on July 3 stated that 30 engineers had been at work since May on the general plans for subway construction. Working plans and specifications only await agreements and decisions on clearance and relative space for platforms and utility galleries, grade of tunnel under the river (tentatively 5 per cent has been used as maximum), type of track, type of construction and kind of crossovers in the tube. Field parties have completed surveys of 25 per cent of existing underground structures and sub-sidewalk space.

Personnel on the Work

Prof. A. C. Willard, University of Illinois, has worked out a positive system of ventilation and will continue his studies and research. Robert Ridgway, chief engineer of New York City Board of Transportation, has been tentatively selected as consulting engineer. L. C. Childs, formerly manager, building department, Bates & Rogers Construction Co., has been engaged as construction engineer under Charles E. De Leuw, chief engineer. M. D. Thompson, formerly assistant engineer, Illinois Central Railroad, will be first assistant engineer.

Other questions that need immediate attention, Mr. Kelker indicated, are as follows: North State St. must be widened from its 66-ft. present width or easements acquired. A new bridge at State St. is necessary because the subway will destroy the pile foundation of the existing structure. Certain lands must be acquired. An assessment roll must be made up of property benefited by the subway. This means a test case in the courts, as there is no precedent for doing such work by special assessment procedure in Illinois.

From the engineering standpoint, work can be started this fall, according to Mr. Kelker. The engineers for the elevated lines have practically completed plans for the north and south approaches to the proposed subway in State St.

Construction Is Begun on Boulder Canyon Project

Immediately upon receipt of telegraph instructions from the secretary of the interior, Walker R. Young, engineer in charge, who was already on the ground, began construction of the Boulder Canyon project on July 7. The first day's operations consisted of beginning work on staking out the railroad and the construction road, surveys of which have already been completed, laying out streets for the town site, and continuation of surveys for the water-supply system.

Secretary Wilbur stated that the plans and specifications are being carried to completion with all possible expedition, looking to advertising for bids and awarding the construction contracts at the earliest possible date. After completion of the railroad, construction road, town site and waterworks, the money appropriated will be used to commence construction of the cofferdams and diversion tunnels.

Suit Against Operation of Saluda Dam

Suit has been instituted to prevent the Lexington Power Co., the holding company of the corporation that owns the Saluda dam, near Columbia, S. C., from maintaining and operating the dam. The action is brought by Thomas Taylor, a Columbia planter, who also seeks $50,000 damages for injury to his plantation, which was inundated last fall when impounded water was released from the dam. Mr. Taylor sets forth in his complaint that the dam and "the accumulation of water therein constitutes a constant menace and threat to the lands of this plaintiff" and is calculated further to "destroy said lands and their usefulness."

Last Headings Holed Through on 14½-Mile Boston Water Tunnel

The last headings met on June 22 on the 14½-mile Wachusett-Coldbrook tunnel being driven to augment Boston's water supply. Driving had been carried on from seven shafts. Concrete lining was started from two of the shafts early this year and to date more than 18,000 ft. of sidewalls and arch concrete has been placed. Another concreting plant is being installed in order that the tunnel may be completed by Jan. 1, 1931. This tunnel will divert the floodflow of the Ware River into the present Wachusett reservoir. Plans have been made to extend the tunnel about 12 miles westward from its present terminus to tap the Swift River. Litigation instigated by the State of Connecticut has tied up the Swift River extension. The case is now in the courts and an early decision is expected, the master appointed by the supreme court having submitted a report adverse to Connecticut's claim.

City Planning Commission Voted for New York

The board of aldermen of New York City voted, 57 to 1, on July 8 in favor of the city planning bill sponsored by the mayor. The bill had previously passed the board of estimate and apportionment. It provides for the creation of a municipal department, headed by a single commissioner, which will prepare a comprehensive master plan for the city's public improvements, but which will be merely advisory to the other departments. The state legislature has twice refused to pass a bill creating a department with greater power.

Canal May Join Bay of Fundy With Gulf of St. Lawrence

A commission to investigate the projected canal across the Isthmus of Chignecto, connecting the waters of the Bay of Fundy with the Gulf of St. Lawrence, has been appointed by the Canadian government. The commission consists of Prof. D. A. McArthur, of Queen's University; Frank McKenzie Ross, of Montreal; Prof. A. B. Balcolm, of Arcadia University; and James J. Johnston, of Charlottetown, Prince Edward Island.

Foreigners to Study North Carolina Sanitation

Angel H. Balcercel, of the Guatamala governmental health bureau, and Nicholas German, city engineer of the city of Cluji, Rumania, will spend ten days in North Carolina, beginning July 17, observing and investigating the work carried on by the sanitary engineering bureau of the North Carolina department of health.

Plan Submitted for Major Highways in Detroit District

CONFORMING to a request of the Wayne County board of supervisors made Sept. 30, 1929, a report containing recommendations for the development of wider major streets in the city of Detroit and its environs has been submitted by the board of Wayne County road commissioners. These recommendations in no way take the place of the master plan for the region, but are supplementary to it. The new plan has been prepared in co-operation with both the Rapid Transit Commission and the City Plan Commission, and is offered to the community as a practical program for the development of its streets and highways, the purpose being to connect the outlying districts with the center of Detroit by means of a system of crosstown superhighways in all directions. Particular projects recommended are shown on the accompanying map, a total of 70 miles of streets being included in the widening program.

Financial Plan

The cost of providing rights-of-way for the new superhighways is estimated at $100,000,000. The report recommends that all routes included in the plan be taken over as county roads, and that the cost of securing the necessary property be financed by the issuance of Wayne County bonds to the amount of $80,000,000, the remainder of the cost to be borne by special assessment. These bonds would be fifteen-year serial bonds issued at the rate of $16,000,000 per year for five years, during which period the necessary property would be acquired. Special assessments against property would be spread over ten years. An additional county road tax of one mill would be levied for sinking fund purposes, such a tax for sixteen years being sufficient to retire the entire bond issue. With the superhighways taken over as county roads and under the jurisdiction of the county, it would be legally possible to use all or a part of the present mill tax for construction purposes, including paving, the construction of grade separations and other features.

The State of Michigan has promised to aid the city of Detroit by paying 50 per cent of the cost of widening those arterial highways which are distinctively state trunk line road extensions in the city. These include Woodward Ave., Michigan Ave., Grand River Ave., Van Dyke Ave. and Gratiot Ave.

A discussion of the present status of superhighway planning and construction in the Detroit region appeared in *Engineering News-Record*, June 5, 1930, p. 940.

Saluda Dam Completed 100 Days Ahead of Time

Completion of the Saluda dam was announced on July 1 by the builder, the Arundel Corporation. The project was finished nearly 100 days ahead of schedule and the corporation will receive a bonus of $1,000 for each day.

PROPOSED STREET-WIDENING PROGRAM IN DETROIT AND ENVIRONS

Road Builders Appoint Grubb for County Road Work

In order to carry out efficiently its program of work for county roads during this year, the American Road Builders Association announces the appointment of Charles E. Grubb, former county engineer of New Castle County, Del., as executive engineer of the association's county highway officials' division.

The division is increasing its efforts toward efficient financing, planning and administration of highways in all counties. A summary of county expenditures for construction and maintenance includes figures just received from 1,066 counties, slightly more than one-third of the total number, and shows that these counties contemplate expenditures for highway and bridge construction in 1930 of $195,157,725, compared with an expenditure of $177,059,754 in 1929. For maintenance, these counties will expend $98,412,832 this year, against $94,249,810 last year.

In his new work Mr. Grubb will travel extensively throughout the United States, conferring with county and township highway officials in regard to their problems. He will particularly concentrate his efforts on states in the Middle West and the Mississippi Valley, where extensive road programs are under way.

Golden Gate Bridge Plans Before War Department

Plans for the proposed bridge across the Golden Gate at the entrance of San Francisco Bay are now before the War Department for final approval, following a public hearing held June 30 and July 1 in San Francisco. Before a board consisting of Lieut.-Col. T. M. Robins and Majors W. H. Lanagan and E. H. Ropes, the adequacy of the proposed plan, in so far as the requirements of navigation were concerned, was defended by the Golden Gate Bridge and Highway District and opposed by navigation interests on the ground that the vertical clearance proposed was not sufficient.

The principal witness for the district was J. B. Strauss, chief engineer, who offered testimony to show that the clearance height at the center of the span would be 225 ft. above low water under average conditions. It was contended that such a structure would be adequate for all existing ships with one exception and that the present tendency in ship design does not indicate any definite trend toward increase in size. Further, it was suggested that it is feasible and not uneconomical to provide topmasts which could be telescoped or lowered.

Opposition to the proposed plan was led by the shipping interests centering in San Francisco Bay, who argued that the clearance of 200 ft. at the piers at high water, allowing a 10-ft. margin for safety, provided a working clearance of only 190 ft., which is held to be not sufficient. Although not opposing a bridge across the Golden Gate, these interests argued that such a structure should provide ample clearance for all present ships and allow for possible future increases in size. Such a minimum requirement requested by these interests would provide a clearance height of 250 ft. at the center above higher high water and 225 ft. at the piers. It was pointed out that the growth of shipping in and out of San Francisco Bay is increasing and that trends in shipbuilding are uncertain.

Following the testimony of the opponents to the plan, the board endeavored to get a statement of the additional cost required to secure the clearance requested by these interests. Mr. Strauss stated that no estimate had been prepared of such additional cost and that it would require a complete redesign of the structure.

Will the Building Slump Break Wages?

Reports From Many Cities Indicate That Lower Rates Are Being Accepted but Union Scales Generally Are Unshaken

IN VIEW of current talk in the press of a possible break in building trades wages, *Engineering News-Record* put the question to its correspondents. Examination of the many statements received from them indicates that while conditions in a number of centers have been sufficiently drastic to cause some workers to take jobs below the recognized scale, there is no widespread practice of this nature. Three cities report thus:

The union scales in the building trades are still in force, but likely to be broken at any time because of unemployment, say contractors, union heads and the men themselves.—*Birmingham.*

In a few trades union men are permitted to work for less than the scale. Contractors admit they are paying smaller wages in a number of instances.—*Richmond.*

Some bricklayers and plasterers who had their cards up to date until the beginning of this year are now accepting wages slightly better than the common labor rate. —*Jacksonville.*

Others reflect the same trend. How many union workers there are in the building trades is unknown, but there are 854,000 in the American Federation of Labor alone. These three cases, however, all in the depressed South, form only a small portion of available evidence of serious unemployment due to smaller building volume. Residential building, the staple which supports the carpenter, is only about half what it was in 1929, when it was low. The volume of other building types is at least 10 per cent below. Union labor is 37 per cent unemployed, compared with only 19 per cent a year ago.

This year's drop in construction volume is a new experience. From 1923 to 1928, inclusive, each year made a new record. This could hardly go on forever, and in 1929 residential building—the class that usually heralds a change, whether up or down—dropped 31 per cent from the 1928 figure, bringing the total for all construction to $9,130,000,000, or 9 per cent under the total for the year before.

Some 35 to 40 per cent of total volume is public-works construction. In 1929 this element was 5 per cent under the 1928 figure, due to a lag in highway construction. This year this element amounts to 13 per cent more than in the first half of 1929. There is, therefore, no abnormal unemployment in the public-works element of construction. This element, however, though totaling in round numbers $3,500,000,000 worth of structures annually, employs directly only 900,000 men, compared with at least 2,000,000 men in the present subnormal building division. The trades chiefly affected are the following, as listed by the Bureau of the Census and confirmed as of date by labor authorities:

Apprentices to building and hand trades	73,897
Brick and stone masons	131,257
Carpenters	887,208
Engineers, stationary, crane and hoist men	279,940
Building, general laborers	608,075
Painters, glaziers and varnishers	248,394
Plasterers and cement finishers	45,870
Plumbers, and gas and steam fitters	206,715
Roofers and slaters	11,378
Stone cutters	22,096
Structural ironworkers	18,836
	2,533,666

Facts From Localities

Minneapolis is an open-shop town, fully three-quarters of the annual value of building being performed on this basis. The present scale, made effective by the Minnesota Building Employers Association on April 15 last, is slightly higher than it was the year before. All the members of the association, which is to say all the larger contractors, adhere to this scale, and only a few small contractors, nonmembers, are paying below the scale. The largest project under construction is a 26-story telephone and office building, on which 60c. is being paid for common labor, the scale being 50c. to 65c. The largest job in St. Paul is a 32-story bank and office, and on it the scale is being paid.

Union members, on the other hand, are reported to be quite generally accepting less than union rates, which are higher than open-shop rates. In this statement only ironworkers are excepted. Electrical workers, strongly organized, are reported to be considering apportioning jobs to members on a split-week basis, say three days per man, with no cut in rate.

Of building trades mechanics residing in Minneapolis, half of those working at their trades are said to be employed outside the city, in the smaller communities, but at the Minneapolis open-shop scale. Men unemployed seem willing to accept wage cuts, but public sentiment is said to be against such reductions. Indications are for a break in rates, and there is the usual prediction that lower wages, by lowering construction costs, might stimulate building.

Kansas City—Unemployment is severe among both union and open-shop workers. Individual instances are cited of plasterers and bricklayers leaving the unions and seeking work where and for what it can be found. Many skilled mechanics are working only two or three days a week, but

there is no evidence of any of them working below their rates.

Urbana, Ill.—Not a case is known where a union man has worked for less than the rate, though employers feel that a break will come.

Oswego is busy on remodeling and repair work, and no effort is being made to cut the rates. On a water contract common wages were cut from 50c. to 40c., but hereafter all water-works jobs will be done by the city. No students will be employed on city work this summer, as they have been employed heretofore.

Trenton has many bricklayers, plasterers and ironworkers out of work, but these unions are strongly organized and the rates are recognized by employers as well as by mechanics. The ironworkers are actually on strike for an increase. Plumbers also struck, but decided to return at the old rate of $12 a day.

Oklahoma City—Residence construction is 75 per cent below normal. Non-union wages are 10c. to 20c. below wages of a year ago. Union men are keeping to their scale, though many carpenters, plasterers and plumbers are idle. The prospect is for still less apartment and store building in the fall and for lower wages within the next six months. In the oilfields, wages remain at $16 per day for drillers and 50c. per hour for roustabouts.

Albany, Troy and Schenectady — Not only is construction labor strongly organized but a larger volume of state and municipal work has helped maintain wage levels. The five-day week is quite generally operative here and higher wages became effective May 1: carpenters from $10 to $11; bricklayers from $13.20 to $14; ironworkers from $1.50 per hour to $1.57½; electrical workers from $1.30 to $1.35. No attempt has been made to break union rates, and no union men are working below the rates. In New York State as a whole, according to John M. O'Hanlon, secretary-treasurer New York State Federation of Labor, 40 per cent of the building trades were unemployed in April, 32 in May, and 20 to 25 at present.

New York City—Most of the larger contractors and subcontractors are members of the Building Trades Employers Association and are living up to agreements extending to 1932. It is reported that carpenters, hodcarriers and concrete laborers have been working below the scale, but many of them usually do. "Aside from carpenters and laborers," says the Foundation Co., "working below scale is confined to jobs where non-union men are used." These are few and small in New York.

St. Louis reports 8,000 to 12,500 of its 17,000 union building mechanics and laborers out of work, compared with 4,000 a year ago, but no surface indications of a break in the scale. The only revisions made in recent weeks were upward: 2,500 painters from $1.4375 to $1.50; 400 cement finishers from $1.50 to $1.575; 200 asbestos workers from $1.45 to $1.50; 400 elevator constructors from $1.60 to $1.67. It is known unofficially that some mechanics are working under the scale through private understanding with their employers. For example, some carpenters are working for $1, when their rate is $1.50, and similarly with plumbers and painters. No bricklayers, plasterers or ironworkers are doing this, though but 25 per cent are regularly employed. Isolated cases of ironworkers going elsewhere to work on open-ship bridge jobs and on a few larger out-of-town building projects are the exceptions. All big construction work in St. Louis is union, with open-shop basis for bungalows, flats and repair work.

Chicago—Some of the building trades were granted increases in the spring of 1929, and more in October, to be effective for five years, thus including the 1933 Chicago World's Fair construction. Present unemployment in these trades is 70 to 80 per cent. The outlook is distinctly unfavorable, as few architects have any work on their boards or expect any. Julius Rosenwald, of Sears, Roebuck & Co., who build houses on time payments, says that few people can afford to build homes at present costs and that a temporary cut in union rates might stimulate this class of building. A six-room brick-veneer two-story dwelling costs $15,000 to build, to which must be added $100 per foot for the lot, or $5,000 for 50 ft. Interest, taxes, coal and upkeep make running expenses double the rent for a six-room apartment.

Sioux City reports good business, with no unemployment.

Knoxville reports a fairly large volume of building, but more unemployment than any time heretofore.

San Antonio—Union rates have not been lowered, but many mechanics (but few bricklayers, plasterers or ironworkers) are working under the scale. The open-shop scale is flexible and wages are lower than a year ago, with the trend down. Some contractors complain that efficiency has decreased in the last ten months. This seems not to be the case on public work, where long-time jobs have led to better production and less demoralization. Building unemployment is placed at 20 per cent, with general conditions improving owing to larger crops and a heavy tourist trade.

Salt Lake City—Total unemployment is 25 per cent, and in the building trades 35 per cent, according to the local chapter of the Associated General Contractors. Contractors do not expect a cut in union rates this summer and the union secretaries say they will maintain the scale, which is the same as a year ago.

Sacramento—An agreement on June 1, 1930, established the five-day week and permits no reductions for two years. Fewer than 10 per cent of the mechanics are unemployed, and laborers are paid more than ever before.

These fifteen specific cases may be regarded as representative generally of present conditions in the building trades of the country. Analysis of many other cases support this. Where construction, usually building, is below normal, employment is below normal; but nowhere is there a large or an organized effort to break the rates. Where building is slowest and unemployment is consequently most severe, the wage question is naturally most acute. It is clear that this question has not been raised because wages are high, but because slack building has caused a surplus of labor and a competitive condition.

One highly important result of this competitive condition is an increase in labor efficiency. This is a common phenomenon in periods of unemployment, but one that is extremely difficult of exact measurement. "Our cost reports," says H. C. Turner, president, Turner Construction Co., "demonstrate clearly that never before (June 18, 1930) have we secured the efficiency of labor production that we are getting this spring."

When labor is plentiful, the large construction companies concern themselves less with ways and means for cutting wages than with strengthening their operating organization by manning it with the most capable and skilled workmen. Their labor economies result from increased performance. "Today," say officials of the Barney Ahlers Construction Corp., which is under bond not to cut the scale, "200 man-hours produce more work than a year ago because of conditions, and this permits lower unit bidding."

Will the building slump break wages? It has not done so appreciably as yet. Whether or not the trend (see chart) is to change depends on how long the slump lasts.

BUILDING COST INDEX NUMBERS, 1922-30

(American Appraisal Co.; 1913 = 100)

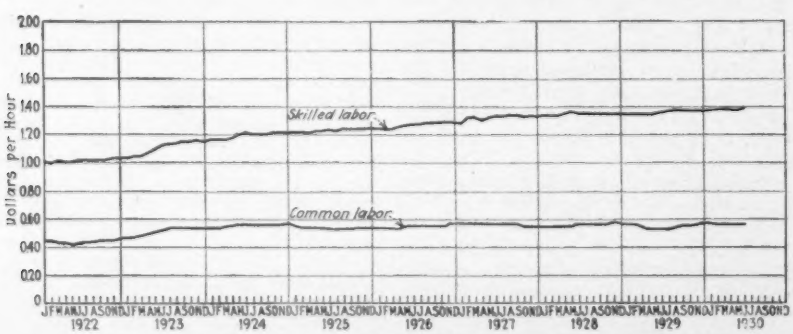
	Wood-Frame Timber	Brick	Steel Brick	Rein.-Conc.	Avg.
1922*	190	196	185	188	190
1923	209	219	212	210	213
1924	205	218	210	206	207
1925	202	210	202	200	206
1926	204	213	199	201	204
1927	204	214	200	200	205
1928	204	213	197	200	204
1929	204	214	197	201	204
1930	202	213	197	201	203
1923-29	205	214	202	203	206

*Deflation year following 1920 peak and 1921 depression.

AVERAGE SKILLED AND COMMON LABOR HOURLY RATES IN TWENTY CITIES, 1922-30

	Skilled	Common		Skilled	Common
1922*	$1.00	0.442	1927	$1.32	$0.554
1923	1.10	.518	1928	1.35	.5558
1924	1.19	.555	1929	1.36	.5465
1925	1.22	.538	1930	1.38	.5625
1926	1.26	.548	1923-30	1.27	.5472

*Deflation year.



TRENDS OF SKILLED AND COMMON LABOR RATES SINCE 1922

Average of prevailing rates in twenty cities; skilled are composite of carpenters, bricklayers and ironworkers.

Civil Engineers' Board Acts on Matters of Current Interest

Meeting in Cleveland in advance of the annual convention, the board of direction of the American Society of Civil Engineers took final action on numerous matters of current society business and initiated action on others. A new district was set up to include western Missouri and the states of Wyoming, Colorado, Nebraska, Kansas and Iowa. Roy C. Goudy, chief engineer of the Colorado & Southern Railway, was appointed a director to represent this new district, the increase in the number of directors from eighteen to nineteen having been provided for by constitutional amendment this spring.

Other matters acted upon were as follows: authorization of a questionnaire on salaries by the committee on salaries; submission of a request to the U. S. Geological Survey that it publish soon certain water-supply papers now four years delayed; appointment of a committee on hydraulics to co-ordinate the activities of all committees having to do with hydraulics, such as those of the irrigation, power and sanitary engineering divisions; changes in the bylaws to conform with the recently adopted plan for changes in functional activities. John F. Coleman, in accordance with precedent, was appointed to a four-year term as one of the society's four representatives on the John Fritz medal committee.

Manuals on construction plant and equipment, on city surveys, and on piles and piledriving are well along toward completion, according to reports by division chairmen to the committee on technical procedure. This committee, considered next to the board of direction in importance, will act for the society in nominating candidates to receive the *Popular Science Monthly* annual award of $10,000 for achievements in science of greatest value to the public.

Future meeting places were decided upon by the northern and southern local sections conferences as Norfolk, Va., for next spring and St. Paul, Minn., for the fall meeting. Tacoma, Wash., already had been selected for the summer meeting next year.

Indianapolis Park Board Wins Billboard Fight

The Indiana supreme court has upheld the Indianapolis park board in its contention that it has the right to prohibit erection of advertising billboards within 500 ft. of the city's parks and boulevards. However, the court decrees that the city must make compensation for billboards ordered removed, unless they can be proved to be nuisances aside from the provision of the ordinance prohibiting their erection. More than 160 billiboards are involved, half of which are illuminated.

Regulation of billboards is part of the city's police power, the opinion sets out. This power, it holds, can be extended to include "esthetic considerations."

WASHINGTON NOTES

By Paul Wooton
Washington Correspondent

Employment Provided by Rivers and Harbors Bill — Progress on Mississippi River Levees

IN SIGNING the rivers and harbors bill on July 3 President Hoover pointed out that the ultimate appropriation of $145,000,000 authorized by the measure will be of material benefit in providing employment. He referred to the bill as a long-view plan for the future. "I do not propose that we should proceed in a haphazard manner," he said. It always has been his contention that the work should be approached on sound engineering lines, completing the main trunk systems and gradually extending the work outward along the lateral rivers.

Eight Solid Facts That Point to Business Upturn

1. *Expanding Bank Credit*—The rate of expansion of bank credit has been increasing steadily and fast since February.

2. *Idle Money*—Bank deposits are increasing more rapidly than loans and investments.

3. *Bare Shelves*—Production activity has averaged 10 per cent below normal for the past six months. A shortage of consumers' goods has developed which will have to be made up quickly.

4. *Public Buying Power*—Although payrolls have been running 15 per cent below average, dividend and interest payments have been 15 per cent higher. The cost of living is down 3 per cent. Unemployment shows no sign of further increase. The purchasing power of the consumer public has not been greatly decreased.

5. *Farm Income Prospects*—Farm income will not be as low as in 1926-27, although lower than last year.

6. *Raw Material Imports*—The United States consumes the bulk of raw materials; sustained buying power for these materials will bring price recovery the world over. Import volumes are running at practically normal levels.

7. *Home Building*—Residential building has ceased to decline and is beginning to turn upward.

8. *Automobile Outlook*—Automobile production has run up to June at 1928 level, with buying demand somewhat above that level.

—The Business Week, July 9.

Virtually every section of the country is provided for in the bill. It is estimated that nearly $50,000,000 will be spent on the connecting channels and the harbors in the Great Lakes territory. A project for relieving the flood danger in southern Florida by constructing levees around Lake Okeechobee also is authorized in the bill, and to this the federal government will contribute substantially.

Deepening and improvement of the upper Mississippi to Minneapolis, the Missouri to Sioux City and the lower Tennessee will be carried out under the terms of the bill. Eventually this work will cost many hundreds of millions of dollars, even though the initial authorizations are relatively small.

Lakes-to-Gulf Waterway

Secretary of War Hurley stated on July 7 that the War Department has made arrangements to take immediate steps under the section of the bill authorizing the federal government to take over the Lakes-to-the-Gulf waterway. Mr. Hurley said that he has designated Lieut.-Col. W. C. Weeks, district engineer of the first Chicago district, as his representative in negotiations with officials of the State of Illinois to work out details of the transfer to federal control. Governor Emmerson, of Illinois, has been requested to appoint representatives for the conference.

It is estimated that it will require $7,500,000 to complete the work on the Illinois waterway. An appropriation of this amount is authorized in the bill, but no immediate government funds are available for the work. Secretary Hurley in the interest of efficient prosecution of the work has therefore requested Illinois authorities to assign to the government $2,000,000 of the amount which the state has been holding in reserve for the construction of bridges across the canal section of the waterway. This amount will be repaid as soon as federal appropriations are available.

Work on Mississippi River

From July 1, 1928, to June 1, 1930, a total of 60,169,329 cu.yd. of material has been placed in Mississippi River levees, according to figures just compiled by the Mississippi River Commission. In May, the latest month for which the tabulation has been made, 4,341,740 cu.yd. was put in place. With the exception of 184,000 cu.yd., all of the work in May was done by contract.

The status of the work at Bonnet Carré is shown by the following table:

	Estimated Total Under Contract	Total in Place to May 31
Common excavation, cu.yd.	420,000	281,220
Levee fill, cu.yd.	75,000	26,412
Steel sheetpiling driven, sq.ft.	600,000	583,324
Wood piling driven, lin.ft.	750,000	746,280
Class A concrete placed, cu.yd	104,000	65,393
Reinforcing steel placed, lb.	280,000	218,904
Sec. 1—Lower highland levee, cu.yd.	560,000	269,000
Sec. 2—Upper highland levee, cu.yd.	400,000	186,000
Sec. 3—Lower swamp levee, cu.yd.	2,910,000	1,383,000
Sec. 4—Upper swamp levee, cu.yd.	3,780,000	925,000

Personal Notes

WILLIAM STRINGHAM, assistant general superintendent of the East Works plant of the American Rolling Mill Co., Middletown, Ohio, since 1923, has been made assistant vice-president of the company.

PRESON P. PHILLIPS, a member of the firm of the Gilbert C. White Co., consulting engineers, Durham, N. C., has been put in charge of the company's newly opened office in Richmond, Va.

HENRY C. ALLEN, former city engineer of Syracuse, N. Y., has been chosen to succeed H. S. Handy as a member of the Syracuse (N. Y.) grade-crossing commission. Mr. Allen was city engineer and chief engineer of the grade-crossing commission in 1917.

RAYMOND J. BARBER, now associated with Stone & Webster, of Boston, Mass., will become instructor of mathematics during the coming year at Clarkson College of Technology, Potsdam, N. Y. Mr. Barber was graduated from Clarkson in the class of 1929.

HENRY F. STUBBS, construction engineer, of San Antonio, Tex., has returned from Chile and is now general superintendent for the Sumner Sollitt Co. on the construction of the three hydro-electric developments on the Guadelupe River recently awarded to that company by the Texas Hydro-Electric Corp., Seguin, Tex.

EARL I. BROWN, colonel, Corps of Engineers, and engineer, Eighth Corps Area, with headquarters at Fort Sam Houston, Tex., has been assigned as engineer of the Philadelphia district, succeeding Col. G. B. Pillsbury, who has been made assistant Chief of Engineers.

JOHN C. GOTWALS, major, Corps of Engineers, has been assigned as engineer commissioner of the District of Columbia to relieve Col. William B. Ladue, who will return to active duty in the Engineer Corps. Major Gotwals is at present district engineer at St. Louis, Mo., and will take up his new duties on July 21.

GEORGE F. BROWN, of Oklahoma City, Okla., who has been engaged in construction work for the past eleven years, has been appointed city engineer of that city. He took office on July 1, and announced that he would make a complete reorganization of the present city engineer's office.

WILLIAM C. LANCASTER, chief engineer of the New York Transit Commission, has been engaged to prepare a report on the alteration of plans for the terminal of the Canadian National Railways at Montreal, especially as to the locations of the lines across the center of the city. Mr. Lancaster will receive a fee of $20,000, to be increased to $75,000 should the report be acceptable to the city, the railways and the federal government.

Society Calendar

AMERICAN SOCIETY OF CIVIL ENGINEERS, New York; annual convention, Cleveland, Ohio, July 9-11.

AMERICAN WELDING SOCIETY, New York; fall meeting, Chicago, Sept. 22-27.

NATIONAL SAFETY CONGRESS, Chicago; annual meeting, Pittsburgh, Pa., Sept. 29-Oct. 3.

CENTRAL STATES SEWAGE WORKS ASSOCIATION at its annual meeting at Springfield, Ill., elected officers for 1930-1931 as follows: president, F. W. Mohlman, Sanitary District of Chicago; vice-presidents, L. F. Warrick, Madison, Wis., and C. K. Calvert, Indianapolis, Ind.; secretary, Gus H. Radebaugh, Urbana, Ill.

GEORGIA BRANCH, Associated General Contractors of America, announces the election of the following officers: president, Carroll Griffin, of the Griffin Construction Co., Atlanta, Ga.; vice-presidents, J. F. Williams and C. R. Collins; treasurer, M. M. Clayton; secretary, A. K. Adams.

INTERNATIONAL CHAMBER OF COMMERCE will hold its next general biennial meeting in Washington, May 4-9, 1931. This will be the first general meeting of the International Chamber in the United States, and it is expected that business men from 47 member countries will attend. The American section of the chamber announces the appointment of Silas H. Strawn, of Chicago, as chairman of the American committee. He succeeds Thomas W. Lamont, whose term expired June 30.

UTAH SOCIETY OF ENGINEERS, at the annual election of officers held in Salt Lake City on June 21, chose the following: president, H. C. Goodrich, chief engineer of the Utah Copper Co.; vice-presidents, C. H. Jones and Dorsey A. Lyon; secretary, Ralph R. Woolley; treasurer, R. K. Brown.

WESTERN ASSOCIATION OF STATE HIGHWAY OFFICIALS, at its fourth annual convention in Salt Lake City, July 1 and 2, reelected the following officers: president, Henry H. Blood, chairman of the Utah state road commission; vice-president, Z. E. Sevison, Wyoming state highway engineer; secretary, J. D. Wood, Idaho state commissioner of public works.

Obituary

JAMES E. HOWARD, engineer-physicist of the Interstate Commerce Commission's bureau of safety in Washington, D. C., since 1914, died at his home in North Conway, N. H., on July 6 in his 80th year. From 1880 to 1910 Mr. Howard was engineer in charge of tests at the Watertown Arsenal in Massachusetts and from 1910 to 1914 was connected with the Bureau of Standards in Washington. He was a member of the American Society for Testing Materials.

CHAUNCEY G. WILLIAMS, of Plainfield, N. J., died suddenly from an acute heart attack on July 6. Mr. Williams was born in Ithaca, N. Y., 65 years ago, and was graduated from Cornell University in the class of 1886. For several years he was associated with the Federal Water Service Corporation, of New York City. He was a member of the American Society of Civil Engineers.

JESSE A. PRITCHARD, former city engineer of Tacoma, Wash., and county engineer of Pierce County, died at Tacoma on June 27 at the age of 70 years. Mr. Pritchard was born in Columbus, Ohio, and went to Tacoma to become chief engineer of the Tacoma & Lake Park Railway & Improvement Co. Later he became chief engineer for the Northern Pacific, Great Northern, Oregon & Washington, and Milwaukee railways, and laid many of the lines used by those companies.

FREDERICK MURCH, of St. Louis, Mo., vice-president of the Murch Brothers Construction Co., died on June 22 from paralysis after a two weeks' illness. He was 64 years old. Mr. Murch was born in England, but came to this country in 1887 and settled in St. Louis. The construction company was formed in 1888, and has erected many buildings throughout the country.

JOHN E. PARRY, secretary of the Glens Falls (N. Y.) Portland Cement Co., was found dead in bed at his summer home in Lake George, N. Y., on July 1. Death was due to heart trouble. Mr. Parry was a graduate of Union College.

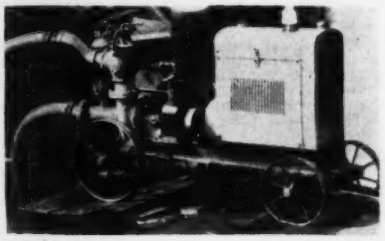
MAX C. KNAPPENBERGER, superintendent of construction for contractors in Syracuse, N. Y., for the past ten years, died suddenly at his home in Syracuse on June 29. He was 40 years old. At the time of his death he was in charge of construction for Fred J. Grassman and previously was general superintendent and office manager for the Dawson Brothers Construction Co.

JOHN W. HILL, for many years a prominent water-works engineer who specialized in filtration and pumping plants, died from a paralytic stroke at his home in Wyoming, Ohio, a suburb of Cincinnati, on June 22, in the 82d year of his age. He was best known for his work as chief engineer of the bureau of filtration, Philadelphia, during the construction of the four original filtration plants and accessories some 30 years ago. Loss of a son from typhoid in the nineties directed Mr. Hill's attention to the suppression of water-borne typhoid fever, as letters published in *Engineering News* at the time attest. He took a leading part in causing a demand for water filtration at Cincinnati and in 1896 became chairman of a commission which reported on the betterment of the water supply of that city before the new intake, reservoirs and filters were built. After a report by consulting engineers in the late 1890's, recommending filtration of the entire water supply of Philadelphia, Mr. Hill was first consulting engineer for the new works, then chief of the bureau of filtration, created to build the works, from early in 1901 to his resignation in June, 1905. Meanwhile, the several filter plants for Philadelphia and important related work had been nearly completed. On his resignation, Mr. Hill returned to Cincinnati, resuming engineering practice there with his two sons. Mr. Hill was one of the experts in the suit brought by St. Louis to enjoin the use of the Chicago Drainage Canal early in this century. During the past 25 years he was consultant and engineer for a number of cities, chiefly on water-works improvements.

Construction Equipment and Materials

Centrifugal Pump Primes Itself

A centrifugal pump which will maintain its prime regardless of the amount of water to be pumped has been announced by the Chain Belt Co., Mil-



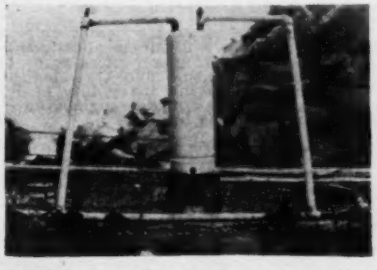
SELF-PRIMING CENTRIFUGAL PUMP UNIT

wuakee, Wis. The self-priming device consists of a vacuum pump, a vacuum chamber and a discharge valve chamber. As soon as the water drops in the intake line, the vacuum pump begins to exhaust the air, and the prime is automatically maintained continuously. The discharge chamber is equipped with a valve to keep the water or air from backing up into the pump, this being so constructed that there is very little possibility of obstructing the valve seat. Because of the efficiency of the discharge chamber valve, no foot valve is necessary. To assure reliable operation, the vacuum pump is driven by a roller chain from the main shaft of the unit.

Gas Prevents Compressed Air Lines From Freezing

Sales rights for Tanner-Tanks and Tannergas, for the prevention of freezing in compressed air lines and tools, have been acquired by the Sullivan Machinery Co., Chicago, Ill. The tank, which is connected to the air line by means of a bypass, contains a liquid, which forms a gas on combination with the compressed air flowing through the tank and is carried into the air line, acting as an anti-freeze. It is claimed that the gas is harmless, non-explosive, odorless, does not wash off lubrication and does not affect hose, gaskets, metal, or paint in spray guns. As it is as light as air, it will not settle in pockets. The freezing point of the liquid is —70 deg F.

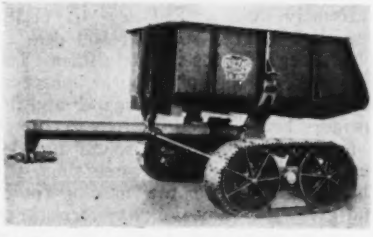
To conserve the gas when it is not needed to prevent freezing, valves are inserted into the bypass so that it can be completely shut off.



BYPASS INSTALLATION OF ANTI-FREEZING DEVICE

Dump Wagon Discharges to Rear

A new addition to the line of earth-moving equipment produced by the Euclid Crane & Hoist Co., Euclid, Ohio, is the gravity rear-end dump wagon, which is made in the 6-cu.yd. size only, for operation on shovel work. This wagon is mounted on the Euclid track-wheel crawler-type chassis, and can be pulled, even under adverse conditions, by a Caterpillar Thirty tractor. The body is dumped by the tractor driver,



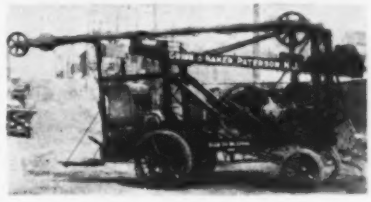
CRAWLER MOUNTED GRAVITY DUMP WAGON

who simply pulls a rope, releasing a catch which permits the load to dump by gravity. When empty, the body rights itself automatically for reloading.

Shock Absorbers Aid Use of Wire Rope in Drilling

Adoption of steel cables for drilling lines in place of hawser-laid manila rope for well drills, especially when used in modern drills having frames made up largely of structural steel, has introduced a new problem for well-drill designers. A 1¼-in. or 2-in. hawser-laid manila drill cable has a stretch of 5 or 6 in. per 100 ft. Expert well drillers always operate on what is called the spring of the cable, which means that when the tools are hanging motionless in the well at the bottom of the stroke in a hole 100 ft. deep, they hang about 6 in. off the bottom. This means that the actual stroke of the tool is considerably greater than the movement of the walking beam or drilling crank at the surface of the ground. With the adoption of wire rope having practically no stretch, it has been found that the destructive effect of the drilling upon the machine is much greater than with manila rope because the shock from the drilling tool is transmitted through the wire cable instead of being largely absorbed, as in the case of manila rope drilling lines. The result has been an increase in the breakage of shafts and gears and the failure of clutches, with the outcome that manufacturers have been compelled to develop means of absorbing this shock from the drilling tools.

The Keystone Driller Co., of Beaver Falls, Pa., recently has added such



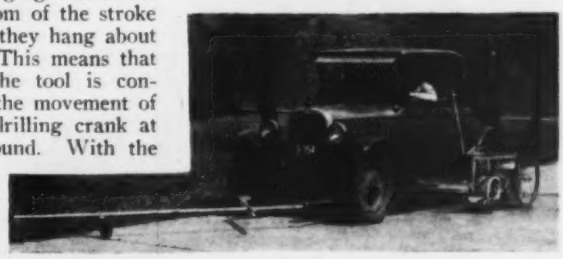
WELL DRILL WITH SHOCK ABSORBERS

shock absorbers to its drilling machines. One of its size 3½ traction drills is shown in the accompanying illustration. It has a steel spring under the front spudding crosspiece and a dual rubber cushion on the rear extension of the walking beams. This application of spring rope-socket absorbers has been found successful in eliminating shocks without reducing the drilling efficiency. The No. 3½ machine has a drum capacity for about 400 ft. of manila line and 800 ft. of steel drilling cable. A divided drum is furnished when wire cable is used.

Road-Marking and Crack-Filling Equipment Improved

Maintenance operations on modern highways are speeded up by two new devices recently developed by Littleford Bros., Inc., Cincinnati, Ohio, comprising an automobile-mounted traffic lane marker and a cone-shaped crack-filling pot.

The road-marking device is an outgrowth of the Littleford Traf-O-Mark, so arranged that the painting unit, which is usually pushed along the road by hand, is now attached to the running board of an automobile. No preliminary lining out is necessary, as a guiding arm, mounted on the front axle of the car, is adjusted so that the mark is automatically centered by maintaining the dangling chain at the edge of the



TRAILER ATTACHMENT FOR MARKING HIGHWAYS

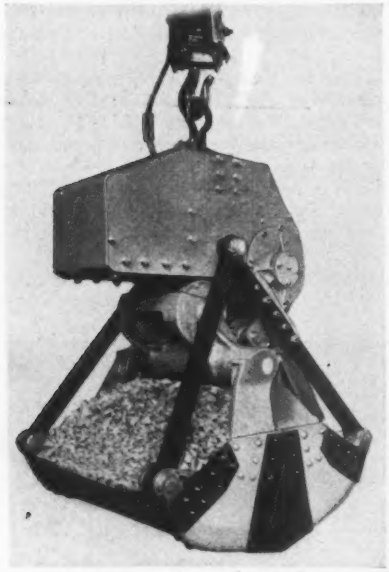
FILLING JOINTS FROM CONICAL POT

road as the car advances. Control of the paint-marking machine is attained from the driver's seat of the car by means of a long handle. When a marking job is completed, both units can be detached from the car in three minutes.

The new crack and joint filler, style 86-B, is made in the shape of an inverted cone 25 in. high and tapering from 8 in. in diameter at the top to a small opening at the bottom adjustable from ¼ to ½ in. Flow of material is controlled by a valve in the bottom of the cone which is operated from the handle of the pot and is ordinarily held in a closed position by its own weight. The unit has a capacity of 2 gal.

Clamshell Bucket Operated by Electric Motor

For greater efficiency in handling sand, stone, cement, clinker and similar bulk materials, a clamshell bucket with an electric motor drive has been developed by the Erie Steel Construction Co., Erie, Pa. This is known as the Strayer electric bucket and is manufactured in sizes from ¾ cu.yd. up, equipped for either direct or alternating current. Advantages claimed for the new bucket are that it can be attached or detached in a short time, works within its own height, digs in so that a full load is always obtained, requires no friction, clutches, chain or trip rope, and empties all or any part of the load as desired. The bucket is built entirely of steel, and is heavily reinforced to stand continuous service.



ELECTRICALLY OPERATED CLAMSHELL BUCKET

Alloy for Welding Copper

After spending considerable time in developing an alloy for use as a general welding and brazing material for copper and copper base alloys, the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has announced Phos-Copper welding alloys, which are marketed in rod and strip form. The material is composed essentially of copper and from 5 to 10 per cent phosphorus, the rod form containing slightly more phosphorus than does the strip. The fluidity of the material is directly proportional to the phosphorus content. Phos-Copper begins to melt at approximately 700 deg. C. (1,292 deg. F.) and becomes extremely fluid at 750 deg. C. (1,382 deg. F.) for the rod and 800 deg. C. (1,472 deg. F.) for the strip form. The presence of the phosphorus prevents the oxidation of both the copper and the surfaces being joined, thereby acting as a flux and producing a sound and dependable joint. At the same time, the phosphorus lowers the melting point and gives the alloy the characteristic of flowing freely when fused. The tensile strength of the deposit or joint varies from 18,000 to 30,000 lb. per square inch and is greater than that of copper, but the ductility is less.

Costs and Contracts

E. N.-R. Index Numbers

Cost			Volume		
July 1, 1930	200.95	June,	1930	324
June 1, 1930	203.36	May,	1930	354
July 1, 1929	204.77	June,	1929	347
Average, 1929	207.02	Average,	1929	317
Average, 1928	206.78	Average,	1928	287
1913	100.00	1913	.....	100

This Week's Contracts

Heavy construction contracts, reported by *Engineering News-Record* in the week of July 10, with some comparisons, total as follows:

(In Thousands of Dollars)

	July 10, 1930	July 3, 1930	July 11, 1929
Buildings:			
Industrial	$9,657	$5,577	$12,794
Other	12,225	32,304	23,831
Streets and roads.	21,099	8,746	17,166
Other eng. constr..	14,470	7,675	14,301
Total	$57,451	$54,302	$68,092

Total, all classes Jan. 1 to July 10:

1930	$1,962,576
1929	2,385,525

Business Notes

HARNISCHFEGER CORPORATION OF CANADA, LTD., Ottawa, Canada, announces the opening of a branch office at 504 Dominion Square Building, Montreal, P. Q. L. P. Deephouse is district manager in charge.

WHITING CORP., Harvey, Ill., has taken over the Goslin-Birmingham Mfg. Co., Birmingham, Ala.

AMERICAN SIKA CORP., New York City, has opened a branch office at 413 North State St., Chicago, Ill.

FOUR WHEEL DRIVE AUTO CO., Clintonville, Wis., celebrates its twentieth anniversary on July 21.

INERTOL CO., INC., New York City, has opened a branch office at 447 Sutter St., San Francisco, Calif. B. W. Mueller has been appointed Western manager, in charge of the office.

ALLIS-CHALMERS MFG. CO., Monarch tractors division, Springfield, Ill., has taken over sales control of the Allis-Chalmers industrial tractor and allied equipment, formerly sold through the United Tractor & Equipment Corp.

MILCOR STEEL CO., Milwaukee, Wis., is the new name adopted by the organization formerly known as the Milwaukee Corrugating Co. and its subsidiaries. There will be no change in management.

CRANE CO., Chicago, Ill., on July 4 celebrated the 75th anniversary of the founding of the company by R. T. Crane.

IDAHO PINE POLE CO. has established a plant at Idaho Falls, Idaho, and is treating pine poles with creosote for power and telegraph companies in the Western states. The capacity of the plant is about 100 poles per day.

GENERAL ELECTRIC CO., Schenectady, N. Y., has divided the industrial heating and welding section of the industrial department into two sections to be headed by C. L. Ipsen as manager of sales for the industrial heating section and L. D. Meeker for the electric welding section.

PARADON MFG. CO., Arlington, N. J., has appointed Francis D. West manager of sales, with headquarters at Arlington. Mr. West has been for the past ten years manager of sales for the Permutit Co. in northern and western New York State, and was formerly chemist in charge of the Torresdale filter plant in Philadelphia, Pa.

New Publications

Torches—A leaflet describing a new product, the T & B torch, used chiefly to guard excavations and other obstacles during the night, has been issued by the CONSOLIDATED IRON-STEEL MFG. CO., Cleveland, Ohio.

Well Screens—EDWARD E. JOHNSON, INC., St. Paul, Minn., has issued a silver anniversary catalog of 28 pp., containing a description of the Johnson well screen, and describing methods of installation.

Ash Conveyors—A new type of pneumatic ash conveyor system known as the Steamatic is described in a 16-p. illustrated bulletin of the UNITED CONVEYOR CORP., Chicago, Ill.

Concrete Reinforcing—Section VII of the National reinforcing manual has been issued by the NATIONAL STEEL FABRIC CO., Pittsburgh, Pa. It is entitled "Concrete Roads and Pavements" and contains 44 pp. of discussion and design data on this subject.

Rustproofing—In a 12-p. illustrated booklet the FAY METAL PATCH CO., Cleveland, Ohio, treats of the prevention of rust with Fishoilene, a specially processed transparent oil which, when spread upon a metal surface, congeals to form a protection against moisture and atmospheric action.

Motors—The first of a series of uniform bulletins which will illustrate and describe the complete line of power units made by the FULLER & JOHNSON MFG. CO., Madison, Wis., is devoted to the heavy-duty models AX and AXK four-cylinder engines developing from 20 to 30 hp.

Centrifugal Pumps—Data explaining the theory, characteristics, operation and installation of centrifugal pumps are given in bulletin 401, a 48-p. publication issued by GOULDS PUMPS, INC., Seneca Falls, N. Y. This presents in more comprehensive, compact and up-to-date form the material contained in bulletins 122 and 124 of the same company, issued several years ago. The material has been compiled by F. G. Switzer, professor of hydraulic engineering at Cornell University.

Unit Prices From Current Construction Bids

Extensive Bridge and Approach Project in Rochester

RIDGE Road bridge, over the Genesee River in Rochester, N. Y., was placed under contract Feb. 7, 1930, by the department of public works, Frank P. McKibben, consulting engineer. The price is $2,494,012. The bridge is a reinforced-concrete multiple-arch structure, main span 300 ft., with stone facing and asphalt block pavement, reinforced-concrete sidewalks and granite curbs. In addition to the bridge there are (1) the west approach with asphalt roadway on concrete base; (2) construction of a newly located park drive on the west side of the river, with surface of penetration macadam, and retaining walls; (3) the east approach, including a circular plaza of 241-ft. diameter with asphalt roadway.

The cut-stone ashlar on the bridge and the wall facings serve as the outside forms for the concrete, several courses being set and anchored in advance of pouring. Parking and landscape work is done by the city. At the conclusion of the work the contractor cleans and points all stonework and exposed concrete, and will not use the river as a dump.

A complete set of foundation borings was made, but they apply only to their specific locations and do not guarantee the character of excavation. If rock is encountered above the elevations shown on the plans and it is suitable for foundation, a deduction will be made for the difference. If foundation material is not found at elevation 3 ft. below those of the plans, the designs will be changed. Backfilling is in horizontal 6-in. layers puddled or tamped.

Concrete Materials—The contractor furnishes cement tests and only one brand is used in exposed surfaces to avoid color variations. The fine aggregate is sand, crushed stone or gravel screenings. Coarse aggregate is crushed stone or washed gravel retained by a ¼-in. screen. For reinforced concrete the maximum is 1¼ in., except in columns where the maximum is up to ¾ in., and in arch ribs 2½ in.

Class A concrete, for sidewalks, slabs, beams, columns, arch ribs, stairs and water piers, has a crushing strength of 2,500 lb. after 28 days. The basis of this is that no more than 6¼ gal. of water per bag of cement is used. The maximum amount of cement is 6.4 bags per cubic yard.

Class B, for abutments, walls, footings and other mass sections in the dry, tests 2,000 lb. Water limit is 6¾ gal. per bag; 5.6 bags per cubic yard.

Each batch is mixed for at least 1½ minutes, to meet a slump test of 2 in. for mass and 6 in. for reinforced concrete. Granite joints are pargeted with non-staining cement before pouring.

Waterproofing consists of two-ply membrane of asphalt-saturated fabric laid in asphalt. The surface to be waterproofed is cleaned and swabbed with hot asphalt, as is each ply of cloth (total 12 gal. per 100 sq.ft.), providing a blanket ½ in. thick. In addition to deck, the backs of all retaining walls are waterproofed with a priming coat of asphaltic emulsion and a second coat of asphaltic compound of consistency to permit troweling.

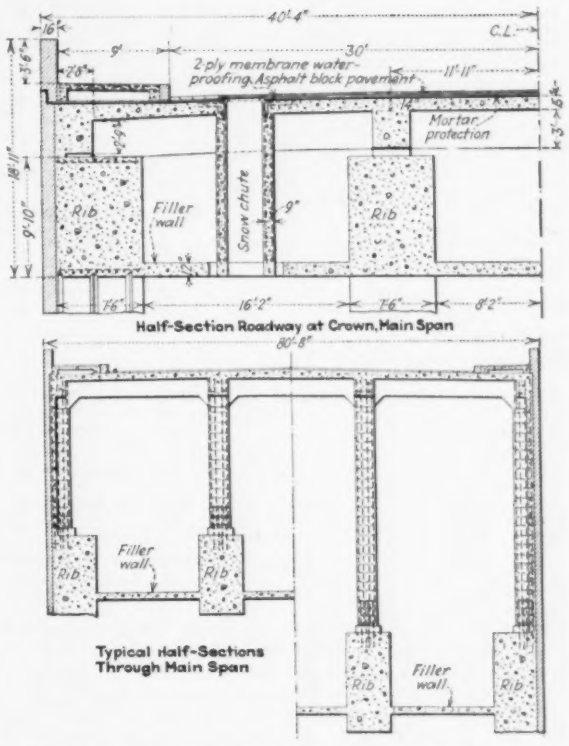


FIG. 2—TYPICAL CROSS-SECTIONS OF MAIN SPAN

Cut-Stone Work—All exposed surfaces of the bridge are faced with light gray-white granite from the same quarry; best New England grade or approved equal. The facing extends from a line 6 in. below grade up to and including the parapet. Ashlar facing is 4 to 8 in., with at least half the surface of 8 in. No stone has a length less than nor three times more than its rise, and does not exceed 12 in.

Pavement and Sidewalks—Paving includes granite block, brick pattern, stone-filled sheet asphalt, bituminous penetration macadam, and asphalt block. A 6-in. cinder fill is laid under all concrete sidewalks except on the bridge and under brick pattern pavements. The vitrified brick is laid on the concrete base on a 1-in. bed of dry sand, tamped, and grouted

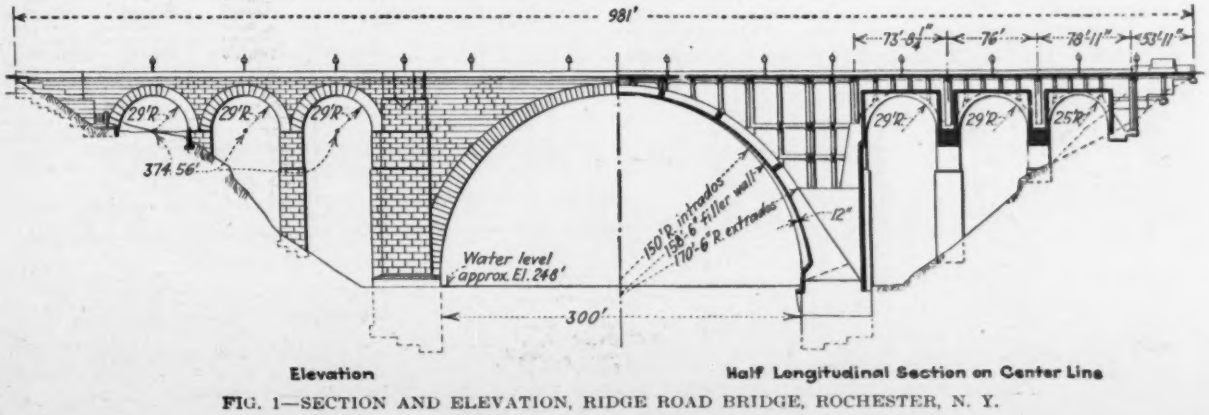


FIG. 1—SECTION AND ELEVATION, RIDGE ROAD BRIDGE, ROCHESTER, N. Y.

	A	B	C	Average of All Bids
Rock excavation, cu.yd.	$10.00	$5.00	$3.00	$8.11
Earth excavation, cu.yd. (These figures include all sheetpiling and shoring, pumping, caissons, etc., and backfilling)	5.00	2.00	1.00	3.34
Class A conc., cu.yd.: Slabs, sidewalks, columns, face walls in place	30.00	18.00	25.00	21.90
Class B conc., cu.yd.: Piers and abutments in place	25.00	15.00	18.00	16.60
Walls and footings in place	20.00	15.00	20.00	17.80
Reinforcing metal in place, lb.	0.04	0.04	0.05	0.0456
Waterproofing on decks, including protective coat, sq.ft.	.09	.15	.30	.21
Waterproofing on walls, sq.ft.	.05	.05	.12	.07
Granite ashlar set and anchored, cu.ft.	5.07	5.00	6.00	4.95
Molded granite set and anchored, lin.ft.	24.00	25.00	25.00	23.40
Granite curb in place, lin.ft.	5.75	5.75	7.00	5.18
Riprap, if required, cu.yd.	5.00	4.00	7.00	5.50
Common brick masonry, cu.ft.	1.00	1.40	1.00	1.27
Penetrated macadam ready for traffic, sq.ft.	.22	.25	.35	.28
Asphalt block ready for traffic, sq.ft.	.33	.34	.35	.33
Sheet asphalt ready for traffic, sq.ft.	.33	.38	.20	.34
Granite block pattern pavement, sq.ft.	.75	.50	2.00	.67
Cast-iron pipe in place, lin.ft.:				
6 in.	1.59	1.50	2.50	1.74
8 in.	2.06	2.30	3.00	2.26
10 in.	2.84	3.00	4.00	2.95
12 in.	3.62	4.20	6.00	4.18
14 in.	4.57	5.80	7.00	4.84
16 in.	5.44	6.80	10.00	5.57
20 in.	7.47	8.00	14.00	7.23
24 in.	10.06	12.00	20.00	10.60
V. T. C. pipe in place, lin.ft.:				
18 in.	1.40	2.50	2.00	2.25
15 in.	.90	1.40	1.75	1.55
8 in.	.50	1.00	.75	.945
Totals	$2,494,012	$2,544,000	$2,595,000	$2,800,000

with 1:2 mortar. The asphalt pavement is on an 8-in. base of 1:3:4½ concrete (1,600 lb.). The pavement is 3 in., composed of 1-in. binder course and 2-in. wearing surface of stone-filled sheet asphalt. The bituminous macadam on West Park Drive is constructed of 6-in. broken stone or slag foundation course filled with screenings. The top course is 3-in. broken stone penetrated with bituminous binder and screenings. The asphalt blocks are 5x12x2½ in., composed of asphaltic cement, crushed rock and inorganic dust. The blocks are placed on a ½-in. cement-mortar bed forming an integral part of the concrete foundation. The sidewalk construction except on the bridge consists of 6-in. concrete on a 6-in. layer of cinders.

Single-Span Steel and Concrete New Jersey Highway Bridges

THE New Jersey State Highway Department will construct two bridges over Pensauken Creek in Burlington and Camden counties. Each will be on new alignment and have 56-ft. roadways with two 6-ft. walks. They will have decks of reinforced-concrete slabs, the roadways overlaid with fabric waterproofing and asphalt-block paving, the curbs protected by a nosing of structural steel angles, with balustrades of reinforced concrete or of concrete posts with panels of iron grillwork.

The bridges are single-span—89 ft. and 62 ft. respectively—consisting of two main girders with transverse floor beams, all of structural steel incased in concrete. The substructure is two concrete abutments with wingwalls, partly plain and partly reinforced, on wood piles. The ends of the deck is protected by end timbers of white oak.

Concrete is of three classes, the constituents measured by volume. The proportions of cement and coarse aggregate are 1:3½ for Class B; 1:4 for C; 1:5 for D. To determine the amount of fine aggregate, divide the void content of the coarse aggregate by 0.87 for B, and by 0.9 for C and D. Crushing strengths are 2,800 lb. for B and C, and 2,250 lb. for D. Coarse aggregate is ¾-in. broken stone or gravel.

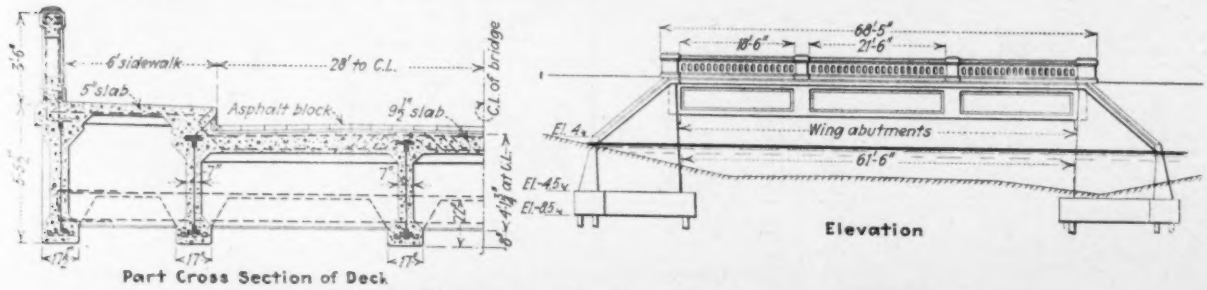
The accompanying tabulation gives the quantities and unit prices for both bridges. The contractor is the Atlantic Construction Co., Atlantic City, the price $123,315.

	A	B	C
1,725 cu.yd. embankment excav.	$0.60	$0.80	$1.20
2,979 cu.yd. unclass. foundation excav.	6.20	8.00	7.00
331 lin.ft. reinf.-conc. balustrade	9.21	8.00	7.00
656 cu.yd. Class B conc.	25.20	30.00	24.00
2,365 cu.yd. Class C conc.	13.00	15.50	17.00
342 cu.yd. Class D conc.	10.75	14.00	15.00
77,640 lb. reinf. steel, dowels	0.039	0.05	0.045
625,160 lb. structural steel	.0.458	.041	.048
1,002 sq.yd. asphalt block paving	4.19	4.50	3.25
9,080 sq.ft. fabric waterproofing	.21	.20	.20
4 end timbers, white oak	141.00	200.00	75.00
1,550 lin.ft. standard metal caging	.07	.10	.10
13,920 lin.ft. wooden piles	.73	.75	.85
1,000 b.ft. flooring	90.00	130.00	60.00

Concrete Deck-Girder Highway Bridge in Kansas

THE Kansas state highway commission on May 11, 1930, awarded contract for a highway bridge and approach in Marion County. The bridge has nine 40-ft. spans and is of concrete deck-girder construction on timber piles. Twelve contractors submitted bids, three on the grading alone, three on the bridge alone, and six on both grading and bridge. The lowest bid on the grading was $11,994, and the largest item was 33,665 cu.yd. of earth excavation at 36c. per cu.yd. All bids on this part of the work were rejected. The lowest three bidders on the bridge were: (A) McMillen & Furman, Emporia, $34,038 (accepted); (B) Ezra King, Heston, $36,177; (C) Independent Construction Co., Pittsburgh, $37,688. The fourth bid was $37,778. The third and fourth bidders stipulated that they would accept only the entire job, including earthwork.

	A	B	C
33,665 cu.yd. earth excav.	$0.36	.....	$0.39
Special excav., per cu.yd.	.70	.....	.70
24 lin.ft. 18-in. culvert metal pipe	2.75	.....	2.00
40 lin.ft. 30-in. culvert metal pipe	4.00	.....	4.00
1,250 lin.ft. wire cable guard fence	1.00	.....	.80
1,309 lin.ft. grubbing hedge	.10	.....	.10
Totals	$13,756	.....	$14,468
Bridge No. 1; Nine 40-Ft. Decks			
540 cu.yd. dry excav.	$1.50	$1.50	$2.00
525 cu.yd. wet excav.	4.50	7.00	9.00
410 cu.yd. class A conc.	17.50	19.00	19.00
532 cu.yd. class D conc.	17.50	19.00	18.00
23 cu.yd. class E conc.	35.00	35.00	35.00
164,190 lb. reinf.	0.046	0.0475	0.05
13,230 lb. steel castings	0.14	0.12	0.10
3,184 lin.ft. timber piles in place	0.85	0.75	0.90
500 sq.yd. riprap	2.00	2.00	2.00
Removal of old bridge	450.00	200.00	300.00
Piling cutoffs, per lin.ft.	0.50	0.50	0.50
Totals	$34,038	$36,177	$37,688



SINGLE-SPAN STEEL AND CONCRETE BRIDGE, SOUTH BRANCH PENSAUKEN CREEK, NEW JERSEY HIGHWAY DEPARTMENT

CONSTRUCTION NEWS

Some of the Week's Large Projects

For further details turn to the appropriate sections in this issue.

Location	Project	Cost	Status
Waterworks			
Calgary (Alta.)	Waterworks Ext.	$3,770,000	Bids asked
Regina (Sask.)	Waterworks	6,000,000	Proposed
Sewers			
Louisville	Sewers	1,749,384	Contract
Bridge			
Boonville (Mo.)	Bridge	1,000,000	Proposed
St. Louis	Bridge approach	3,250,000	Proposed
Unclassified			
Texas and Missouri	Pipe line equipment	1,000,000	Contract
Fort Churchill (Man.)	Grain elevator	2,000,000	Contract
Ontario	Model town	2,000,000	Proposed
Fed. Govt.			
Washington	Extensible building	2,074,000	Contract
Factories and Mills			
Ontario (Calif.)	Plant	1,000,000	Proposed
Pittsburg (Calif.)	Plant	5,000,000	Contract
Wichita (Kan.)	Factory	1,000,000	Contract
St. Louis	Factory	2,000,000	Proposed
Building			
Springfield (Mass.)	Hospital	1,000,000	Proposed
St. Louis	Hospital	1,000,000	Proposed
Buffalo	Hospital	2,000,000	Proposed
New York	Loft	1,500,000	Proposed
London (Ont.)	Office	1,000,000	Contract
Newtown (Conn.)	Asylum	1,750,000	Bids asked
Paterson (N. J.)	Hall of Records	1,000,000	Proposed
New Castle (Pa.)	Court House and Jail	1,000,000	Proposed
New Haven	University	2,500,000	Proposed
Perth Amboy	Theatre	1,000,000	Proposed
New York	Theatre	1,000,000	Proposed
St. Louis	Merchandising mart	5,000,000	Proposed

WATERWORKS

PROPOSED WORK

Colo., Pueblo—Trustees Pueblo Waterworks, D. P. Porter, supt., 319 West 4th St., preliminary plans large reservoir.

Ind., Pendleton—Surveys waterworks, incl. pipe lines, deep wells. $35,000.

O., Brookpark (br. Cleveland)—Village, 4,400 ft. 6 and 8 in. c.i. main. $25,000. Wight-O'Rourke Co., Guarantee Title Bldg., Cleveland, engrs.

O., Loudenville—City, 160,000 gal. concrete reservoir. Miller & James, Erie Bldg., Cleveland, engrs.

Okla., Checotah — Preliminary plans new artesian water supply. $17,000. A. D. Sanders, mayor.

Okla., Lawton—Complete waterworks and filtration plant. $600,000. Burns & McDonnell Eng. Co., 400 Interstate Bldg., Kansas City, Mo., engrs.

Ore., Salem — Barr & Cunningham, civil engrs., Spaulding Bldg., Portland, have been employed to make report on conditions and necessary repairs, improvements of Salem water system now owned by Oregon-Washington Water Co., with the object of the city purchasing, extending and improving of same. $2,000,000 bonds voted for same.

Sask., Regina—City retained Wynne-Roberts, Son & MacLean, consult. engrs., Metropolitan Bldg., Toronto, Ont., to prepare report on water supply improvement. $6,000,000. D. A. R. McCannel, city engr.

BIDS ASKED

Calif., Eureka — J. Griffiths, supt. P. Wks., taking bids 5,500 ft. 4- to 8-in. c.i. pipe.

Calif., Los Angeles—July 16, by Purchasing Agent City Water & Light Bureau, 2 atmospheric indoor water coolers. Advertisement 1356.

Mass., Boston—July 22, at office Metropolitan Dist. Water Comn., 24 School St., 2 superstructures, appurtenances for Wachusett-Coldbrook Tunnel, at Shafts 8 and 1, in Barre and West Boylston.

Mich., Detroit—July 29, by Bd. Water Comrs., furnishing, laying 5,600 ft. 66 in. and 7,100 ft. 54 in. lockbar, hammer-welded, electrically welded or riveted water pipe made of steel Armco, Ingot iron or Toncan Copper Molybdenum iron plates ¼ in. thick in Central, Whittaker and Beard Aves., Fort and Post St. between Edward and Jefferson Aves. L. P. Fisher, pres.; adv. E. N.-R. July 10.

Minn., St. Louis Park — July 16, by H. J. Bolmgren, village recdr., Linden Hills Station, Route 3, Minneapolis, furnishing 1,000 ⅝ in. and 100 three-quarter in. water meters.

Neb., Snyder—July 17, by J. R. Bolte, city clk., 40,000 gal. steel tank on 90-ft. tower with alternate bids on 50,000 gal. and 60,000 gal. tanks; 1,940 ft. 6 in. and 940 ft. 4 in. "B" c.i. pipe, or McWane, DeLavaud, mono-cast or University pipe, 1 ton specials, 1 hydrant, 8 gate valves and boxes. Henningson Eng. Co., Union State Bank Bldg., Omaha, engrs.

N. J., Hammonton—July 24, by Bd. Water Comrs., 2,750 ft. 8 in.; and 1,317 ft. 6 in. main extensions. J. A. Baker, town engr.; adv. E. N.-R. July 10. Noted July 3.

New York—July 22, by Bd. Water Supply, 346 Bway., New York, one combination 4 x 5 x 10 ft. sluice gate and operating mechanisms, for Uptake Chamber 1, at Hill View Reservoir. G. J. Gillespie, pres.; adv. E. N.-R. July 10.

N. Y., Brooklyn—July 18, by J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, mains in Avenue Z, Cropsey, and Stillwell Aves., Hoyt, Sackett, East 7th, East 18th, South 49th, North 1st and Bay 46th Sts.

N. Y., New York—July 15, by J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., steel and c.i. mains in Riverside Dr. W. and viaduct.

N. Y., St. George—July 15, by J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, mains in Arden Ave., Victory Blvd. and Richmond Hill Rd.

N. Y., Syracuse — July 14, by City. Div. Water, fine grading and lining 108,000,000 gal. reservoir with gunite, concrete slab or concrete slab bottom and gunite slopes. M. B. Palmer, consult. engr.

O., Bucyrus—July 11, by C. E. Korer, service dir., addition to filtration plant, incl. 100,000 gal. roped sand filter. $25,000. Jennings-Lawrence Co., Hartman Bldg., Columbus, engrs.

Alta., Calgary—July 16, by City Clerk, extending waterworks. $3,770,000. A. S. Chapman, city engr. Gore, Nasmith & Storrie, Confederation Life Bldg., Toronto, Ont., consult. engrs. Noted Dec. 5.

Ont., Niagara Falls — July 17, by S. E. Godard, mgr. Water Comn., ½ m.g. filtration and pumping plant.

CONTRACTS AWARDED

Calif., Los Angeles—Bd. Supervs. Los Angeles Co., needle valve for gates at Big Tujunga Dam, to Pelton Water Wheel Co., 18th and Harrison Sts., San Francisco, $14,908.

Calif., Modesto—City, 2,000 ft. g.p.m. deep well turbine pump and motor, to Byron-Jackson Pump Mfg. Co., Berkeley, $4,163.

Conn., New London—G. E. Watters, city engr., waterworks improvements, incl. embankment, concrete lined reservoir, pump house extension, 10, 12 and 16 in. watermains, valves, fittings, connections, centrifugal pumps, venturi meter and recorder, to N. Benvenuti & Sons, 74 Goshen St. Est. $80,000. Noted June 12.

Ill., Galesburg—For 9,000 lin.ft. 4 and 6 in. c.i. mains, own forces. T. Snowball, supt. Water Dpt. Noted May 29.

Ind., Westville—Waterworks, to Cole-Moore, Inc., South Bend, $28,608.

Kan., Atchison — Atchison Water Co., 3½ m.g.p.d. triple expansion pump, to Worthington Pump & Mchy. Corp., 710 Dwight Bldg., Kansas City, Mo.; few blocks 6 and 8 in. c.i. mains, own forces. Est. $18,000.

Kan., Topeka—City, 11,255 ft. 18 and 24 in. c.i. main extensions in 12th St., Oklay and Euclid Aves., incl. 34,051 lb. special fittings, to Kirkham & Kilmer, 1410 Pembrook Lane, $68,-113. Noted Apr. 3.

Mass., Gloucester — Bd. Water Comrs., 10 Proctor St., water supply, dam, reservoir, to C. & R. Constr. Co., 75 Bradeen St., Roslindale, $195,750. Noted June 19.

N. J., East Orange—Bd. Water Comrs., City Hall, pumps, driving wells, to Kelly Well Co., Grand Island, Neb., $84,400. Est. $90,000. Noted May 29.

O., Bexley (mail Columbus)—S. W. Roderick, village clk., 3,780 ft. 8 in. mains, to H. E. Miller, 209 South High St., Columbus, $15,029. Noted June 12.

Pa., Phila.—Dpt. P. Wks., Bureau of Water, A. Murdock, dir., City Hall Annex. Contr. 948, 24 and 30 in. pipe at lower Roxborough and Contr. 992, flywheel plant forms for Lardners Pumping Station, to M. and J. B. McHugh, 892 North Marko St., $13,295 and $4,527 respectively; Contr. 979, steam heating system, to Keystone State Piping & Constr. Co., 738 East Venango St., $9,725; Contr. 892, plumbing for Belmont Pumping Station and Contr. 988, crane hoists for Belmont filters, to Acme Machine Co., 27 North 38th St., $8,745 and $1,800 respectively; Contr. 987, high pressure fire mains, to P. and A. J. Ellis, 4th and Wyoming Sts., $169,725; Contr. 980, check valves at Belmont Pumping Station, to Automatic Cone Valve Co., 228 North La Salle St., Chicago, Ill., $7,208; Contr. 990, low pressure fire hydrants, to A. P. Smith Mfg. Co., East Orange, N. J., $31,150. Grand total $246,175. Noted June 12.

B. C., Vernon—Vernon Irrigation Dist., earth dam with clay core wall, concrete conduit, tower, speedway, to A. R. Smith, Vernon, $44,680.

Ont., Brantford—Chairman Water Comn., filtering equipment, to W. J. Westaway Co., Main St., Hamilton. Noted June 26.

SEWERS

PROPOSED WORK

Calif., Los Angeles—Bd. P. Wks. soon takes bids 33,810 ft. storm drains in Olive St. and 23rd St. Impvt. Dist. $376,000.

Calif., Martinez—For 2,950 ft. 30 in. and 5,500 ft. 36 in. vitr. sewers, 326 lin.ft. 36 in. and 1,875 ft. 48 in. rein.-con. sewers. R. L. Calfee, 322 Arlington Ave., Berkeley, engrs.

Colo., Dolores — Soon takes bids sanitary sewerage system. $30,660. D. S. Thomas, city clk.

Mo., St. Louis—Bd. P. Serv., City Hall, soon takes bids storm and sanitary sewers to serve district west of McCausland Ave. from Manchester Ave. to Arsenal St. $200,000. W. W. Horner, city engr. Noted June 19.

N. J., Spring Lake—Mayor and City Council sewage disposal plant, new intercepting sewer in Ocean Ave. $150,000. G. R. Moore, 603 Mattison Ave., Asbury Park, engr. Noted Nov. 7.

O., Dayton—Storm sewer and rein.-con. paving 9,000 sq.yd. Findlay St. from Mad River Bridge to Valley St., 40 ft. $50,000. J. F. Hale, city engr.

See proposal advertising on page 108

Constr. News page 11

LEADITE

Trade Mark Registered U.S. Pat. Office

All costs are Reduced when LEADITE is used

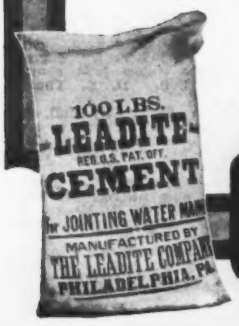
Of course, the greatest advantage in using LEADITE, is, that it makes a good, tight joint,—and thus reduces leakage to a minimum, —but LEADITE also offers the following advantages, which are worthy of serious consideration: Saves caulking expenses—Reduces cost of digging large bell-holes—Saves in cost of material — Reduces time required for pumping "wet trenches"—Saves time in preparation—Saves time in handling on the job—Saves in Freight and hauling charges.

Another point, LEADITE saves "interest charges" by speeding up the completion of the water line.

The true value of LEADITE is best indicated by the fact that it has been used on THOUSANDS OF MILES of Water Mains,—all over this Country, as well as in many Overseas Countries.

The Pioneer self-caulking material for c. i. pipe.
Tested and used for over 30 years.
Saves at least 75%

THE LEADITE COMPANY
Land Title Building Philadelphia, Pa.



No Caulking

Sewers (Continued)

Okla., Westville—Sewerage system, disposal plant, $40,000 bonds voted. Benham Eng. Co., Perrine Bldg., Oklahoma City, engrs. Noted June 26.

R. I., Providence—For c.i. sewers in Basswood, Leo and Thurbers Aves., Dart, Nelson and Waller Sts. $25,000 or more. O. S. Howes, ch. Sewer Comn.

Tex., Dallas—City, c/o E. Goforth, secy., soon takes bids sanitary sewer mains in Warren Ave. from Wall St. to Texas & New Orleans R.R. tracks, $235,000; bids about Aug. 1, constructing Turtle Creek sanitary sewer relief from McKinney-Lamar Underpass to Pitzhugh Ave., $250,000. W. S. Tanner, sewer engr.

BIDS ASKED

Calif., Mill Valley—See "Streets and Roads."

Colo., Dolores—July 18, by D. S. Thomas, city clk., sanitary sewerage system. $30,880. A. A. Weilang Eng. Co., 1st Natl. Bank Bldg., Pueblo, engrs.

Ill., Chicago—July 24, by H. E. Hoff, clk. Sanitary Dist. of Chicago, 910 South Michigan Ave., West Side Sewage Treatment Works Div. U; adv. E. N.-R. July 10.

Mass., Boston — July 16, by Dpt. P. Wks., sewerage works in West Roxbury; July 18 in Dorchester. J. A. Rourke, comr.

Mich., Detroit—July 22, by H. I. Dingeman, drain. comr. Wayne Co., constructing Mayburn Tile Drain, 19,941 ft. 6- to 36-in. concrete or vitr. pipe at depths from 9 to 17 ft., 69 catch basins, 42 manholes, septic tank, pumping plant, motor driven centrifugal pump, equipment. Dearborn Twp. J. J. Murphy, Murphy Bldg., Detroit, engr.

Miss., Greenville—July 21, by City Council, sanitary main and lateral sewers, sewage pumping station. G. Drew, city clk.; adv. E. N.-R. July 10.

N. Y., New York—July 15, by H. Bruckner, pres. Bronx Boro, Crotona Park, 3rd and Tremont Aves., sewers in Lurting and St. Lawrence Aves.

N. Y., St. George—July 16, by J. A. Lynch, pres. Richmond Boro, Boro Hall, sanitary sewers in Stanley and Brighton Aves.

O., Miles Heights (br. Cleveland)—July 14, by Village, storm, sanitary sewers and water curb connections in 10 streets. To exceed $100,000. East End Eng. Co., Town Hall, engrs.

Okla., Vinita—July 15, by C. O. Wattenbarger, city clk., extending 14,000 ft. 8 in. vitr. clay sanitary sewers in Cherokee and Adair Sts. $25,000. F. C. Cowell, Vinita, engr.

Ore., Portland—City Comn. bids about Aug. 26, sanitary and storm sewer, paving in Guilds Lake Dist. $300,000. Former bids rejected. O. Laurgaard, city engr. Noted June 12.

Pa., Creighton—July 15, by W. Orris, secy. Bd. County Comrs. East Deer Twp., Municipal Bldg., 2,155 lin.ft. 18- to 24-in. concrete pipe, 6 manholes in streets Penn. R.R. to Marion St., incl. Glassmere Plan of lots, East Deer Twp. A. M. Douglass, Columbia Bank Bldg., Pittsburgh, engr.

Pa., Phila.—July 16, by Dpt. P. Wks., Bureau Eng. & Surveys, A. Murdoch, dir., City Hall Annex, Schedule A, branch sewers in 18 streets and avenues; Schedule B, main sewers in Hammond Ave., Schedule C, sewage disposal project.

Tex., Dallas—See "Proposed Work."

CONTRACTS AWARDED

Ky., Louisville — Commissioners of Sewerage, 400 M. E. Taylor Bldg. (1st unit) 5,480 lin.ft. rein.-con. sewer, 27 ft. 6 in. high and 18 ft. 4 in. wide and 4,340 ft., 23 ft. 6 in. high and 15 ft. 8 in. wide cross country right-of-way, to Pittsburgh-Foundation Co., Keystone Bldg., Pittsburgh, Pa., $1,749,364. Est. $4,000,000. Noted May 22.

La., New Orleans—Sewerage & Water Bd., 526 Carondolet St., truck type switchboard in Drainage Station 2, to Westinghouse Electric & Mfg. Co., 501 Lang Ave., Pittsburgh, Pa., $43,250. Noted May 15.

Nev., Reno—J. B. Reese, city clk., trunk line sewer, to Christensen & Co., Reno, $329,940. Noted June 12.

N. Y., Long Island City—G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., to P. J. Greenough, 9919 Guilford Ave., Forest Hills, sewers in 62nd St. $7,122, 99th St. $4,084; to R. Iovino, 678 Glenmore Ave., Brooklyn, Myrtle Ave. $992, 98th St., $1,244; to Napolitano Bros., 43rd Ave. $3,563, Foch Blvd. $8,862, 115th Ave. $3,185; to Catapano & Ambrosio, 1016 60th St., Brooklyn, 164th St. $27,013, 218th Pl., $13,434; to Pan Constr. Co., 148th St., $11,736; to C. Soviero, 157 Ashford St., Brooklyn, Rico Pl., $589; to S. Querierro, 1024 66th St., Rockaway Blvd., $21,606. Grand total $103,435. Noted June 19.

O., Bexley (mail Columbus)—S. W. Roderick, village clk., 18,750 ft. sanitary sewers in 22 streets, to H. E. Miller, 209 South High St., Columbus, $34,950. Noted June 12.

O., Cleveland—See "Airports."

O., Cleveland—For 274 ft. 6 ft. Circular "E" brick sewer in Addison Rd., to Iafornaro Co., 3309 Meadowbrook Blvd., $9,373; 254 ft. 6 x 9 ft. and 1,086 ft. 6 x 8 ft. rein.-con. sewers in Kingsbury Run, to H. J. Scott Constr. Co., 4816 Brookpark Rd., $36,513. Noted June 15.

O., Oberlin — Village storm and sanitary sewer in 3 dists., to Cogito Constr. Co., 12616 Corlett Ave., Cleveland, $75,037. Noted June 12.

Pa., Phila.—Dpt. P. Wks., Bureau of Eng. & Surveys, A. Murdock, dir., City Hall Annex, to A. Di Sandro & Son, 6400 North 5th St., branch sewers in Clapier St. $4,287, Southampton Ave. $5,555, main sewers in Gorgas Lane, $35,248; to J. J. McHugh, 1617 Race St., branch sewers in Cliveden St. $6,907, Comly St. $2,242, and G St., $3,088; to E. Vantresco, 6016 Ross St., Coulter St., $9,532; to Trio Constr. Co., 6501 Haveford St., Dudley St., $8,373; to Visco & Di Sandro, 609 Rising Sun Ave., Eastburn St., $2,308; to J. P. McDevitt, 6445 Frankford St., G St., $10,829; to Campbellone & Divrio, 3856 North 10th St., H St., $4,099, Bath St., $5,402; to Ioric & Amorosa, 141 North Gross St., Howell St., $3,057; to J. Salvucci & Co., 6601 Callowhill St., Limekiln Turnpike and Walnut Lane, $12,095, Maryland St., $12,919, Park Ave., $9,307; to Leva Bros., 104 West Gale St., Michener St., $6,712; to T. M. Dunkin, Ashton and Grant Sts., Montour St., $4,811; to P. and J. Ellis, 40th and Wyoming Sts., Olney Ave. and Pacific St., $2,793; to Erinato & Ventresco, 6016 Ross St., Stenton Ave., $3,781; to Vincent Neamand, 628 Lerick St., Vankirk St., $994; to Leva Bros., 104 West Gale St., Michener St., $6,712; to T. M. Dunkin, Ashton and Grant Sts., Montour St., $4,811; to P. and J. Ellis, 40th and Wyoming Sts., Olney Ave. and Pacific St., $2,793; to Erinato & Ventresco, 6016 Ross St., Stenton Ave., $3,781; to Vincent Neamand, 628 Lerick St., Vankirk St., $994; to Leva Bros., 104 West Gale St., Michener St., $6,712; to T. M. Dunkin, Ashton and Grant Sts., Montour St., $4,811; to P. and J. Ellis, 40th and Wyoming Sts., Olney Ave. and Pacific St., $2,793; to Erinato & Ventresco, 6016 Ross St., Stenton Ave., $3,781; to Vincent Neamand, 628 Lerick St., Vankirk St., $994; to Michael J. D. Driscoll, 100 Apstey St., main sewer in Glendale Ave., $96,459; to J. E. Robinson, 5231 Catherine St., borings by water jet, $4,150. Grand total $254,948. Noted June 12.

R. I., Woonsocket—Special Comn. on Sewage Disposal, City Hall, sewage treatment plant and works, to Fish-Rutherford Co., Inc., Chestnut St., Phila., Pa., $357,038. Noted June 26.

Tex., El Paso—City, c/o H. Rosch, 1 mi. 27- to 60-in. storm sewers and pumping plant, to J. B. McCrary Co., 518 Praetorian Bldg., Dallas, $90,258; installing 3 pumps for storm sewer outfall pumping station with motors and all auxiliary equipment, to Fairbanks-Morse & Co., 1713 North Market St., El Paso, $10,252.

Wis., Milwaukee—Sewerage Comn., 3 rotary sludge driers at Jones Island Disposal Plant, to J. D. Farrasey, Cleveland, O., $47,950. Noted June 19.

Ont., Kitchener—W. P. Clement, mayor, and City Council, City Hall, sewerage disposal plant, to Dunker Constr. Co., King St. W. $217,000; equipment, to Dorr, Inc., 330 Bay St., Toronto, $70,000. Noted June 5.

WASTE DISPOSAL

PROPOSED WORK

N. J., Secaucus—Bd. Freeholders Hudson Co., Court House, Jersey City, incinerator to serve North Hudson municipalities. $250,000. F. J. Radigan, Court House, Jersey City, co. engr.

CONTRACTS AWARDED

N. J., Roselle Park — Boro Council, Boro Hall, incinerator, to Nye Odoriess Incinerator Co., 50 East 42nd St., New York, $62,500. Noted Apr. 24.

BRIDGES

PROPOSED WORK

Maine—State Hy. Dpt., Augusta, bridge over Kennebec River between Richmond and Dresden. To exceed $25,000.

Mo., Boonville—Missouri-Kansas-Texas R.R. Co., F. Ringer, ch. engr., Railway Exch. Bldg., St. Louis, rein.-con., steel double track railroad bridge to replace existing bridge over Missouri River. $1,000,000.

Mo., St. Louis—Bd. P. Serv. 5 railroad approaches to east end St. Louis Municipal Bridge across Mississippi River. $3,250,000. Private plans.

N. J., Rahway—Bd. Freeholders Union Co., Elizabeth, steel, concrete bridge over Rahway River, on Hamilton St. $29,000. R. Collins, Court House, co. engr.

O., Cleveland — State Hy. Dpt., Columbus, rein.-con. bridge on Station Rd. $500,000. A. Felgate, Court House, engr.

Okla., Tulsa — Preliminary plans rein.-con. viaduct on North Boston Ave. $175,000. H. A. Parker, City Hall, engr.

Ore., Marshfield—State Hy. Dpt., Salem, bids in fall, 160 ft. steel bridge, near here, in Coos Co. $300,000. R. Klein, Salem, state hy. engr.

Texas and Mexico—Kansas City, Mexico & Orient Ry., F. H. Olmsted, ch. engr., Los Angeles, Calif., 210 ft. rein.-con., steel railway bridge over Rio Grande River at Presidio Tex. to Mexico side, 24 ft. wide.

BIDS ASKED

Kentucky—July 31, by State Hy. Dpt., Frankfort, seven 50 ft. span rein.-con. deck girder bridge over Green River on Liberty-Somerset Rd., S. P. 82½ BB, Casey Co.—rein.-con. substructure for steel span, also two 50 ft. rein.-con. spans on Sandy Hook-Rodburn Rd. F. R. 14-A-B, Elliott Co.—180 ft. span steel superstructure on Sandy Hook-Rodburn Rd., F. R. 14-BB, Elliott Co. B. Johnson, chn.

Maine—Canadian Pacific R.R. Co., J. M. R. Fairbairn, ch. engr., Montreal, Que., taking bids substructures, high pier spans, deck plate girder and deck truss for 2 bridges at Greenville and Brownstone Junction. Noted July 3.

Mass., Groton — Town, G. Pierce, supt. streets, taking bids rein.-con. steel bridge over Squannacock River between Groton Center and West Groton. $45,000. Morse & Dickinson, 25 Washington St., Boston, archts. Noted Apr. 10.

Mass., Ludlow—State, Dpt. P. Wks., Boston, bids about July 10, bridge over Chicopee River. Waddell & Hardesty, 150 Bway., New York, consult. engrs. Noted June 26.

Michigan — July 16, by Ingham Co. Road Comn., Mason, S. R. Br. 1 of 33-10-29 Contrs. 1 and 2, Ingham Co., 2 rein.-con. abutments, two 40 ft. span, 22 ft. roadway. R. R. Havens, Jackson, resident engr.

Minnesota—July 22, by State Hy. Dpt., St. Paul (**S.P. means State Project**), Bridge 4957, 140 ft. long over Pigeon River, S.P. 1-17; Cook Co.; Bridge 4944, 150 ft. overhead structure at Lake City, S.P. 3-24. J. T. Ellison, ch. engr. hys.

O., Akron—July 23, by Comrs. Summit Co., Court House, 1 span, 143 ft. steel truss bridge concrete abutments, on Akron-Peninsula Rd. $81,000. H. G. Sours, Court House, engr.

Pa., Allentown—July 17, Bd. Comrs. Lehigh Co., 3 span concrete, steel bridge over Lehigh River, Lehigh Valley R.R., Central R.R. of New Jersey. $600,000.

West Virginia—July 22, by State Hy. Comn., Charleston, (**P. means Project**) Maysville Bridge 1224, three 26 ft. spans concrete slab, P.3215-A, Grant Co.—Little Beaver Creek Bridge 1218, 40 ft. span concrete arch extension, P. 173-D, Raleigh Co.—Den-Run Bridge 1204, 60 ft. concrete arch span, P. 1098, Ritchie Co.—Gorrells Run Bridge 1186, 20 ft. span concrete arch culvert, P. 18, Tyler Co. G. E. White, secy.

CONTRACTS AWARDED

California — T. A. Tomasini, 209 Post St., San Francisco, steel span toll bridge over Richardson Bay from Sausalito to Belvedere, Marin Co., incl. 7,800 ft. creosoted pile trestle with concrete floors, small steel bascule span in center of bridge, to Jasper-Stacy Co., 216 Pine St., San Francisco, $650,000.

Calif., Hoopa—Humboldt Co. (Eureka) steel bridge over Trinity River, to T. Englehart Co., Eureka, $40,687. Noted June 12 under "Eureka."

Georgia—J. W. Barnett, engr., East Point, bridge on Athens-Watkinsville Hy., Walton Co., to Beckham-Lawler Contg. Co., Perry, $29,863; bridge on Winder-Jefferson Hy., Barrow Co., to D. B. Scott & Co., Decatur, $18,745. Noted June 19.

Kan., Atchison — Atchison Co., Arrington Bridge over Delaware River 25 mi. west of here, to Wyland Bridge Co., Washington, $15,617; Curlew Bridge over Stranger Creek, 10 mi. southwest of here, to Schlickter Bridge Co., Clay Center, $9,993.

Mass., Blanford — Commonwealth of Massachusetts, Dpt. P. Wks., Boston, rein.-con. bridge, bituminous macadam approaches, and paving 5,100 ft. hy., to Warner Bros. & Goodwin, Sunderland, $39,846. Noted June 19.

New York — A. W. Brandt, comr. Hys., Albany, bridges in St. Lawrence Co., to Lord & Hunphrey, Rouses Point, $82,512 est. $91,671—Albany Co., to Maloy & Thompson, Albany, $46,040 est. $63,454—Greene Co., to M. A. McCoy, Utica, $61,060 est. $94,958—Lewis Co. to Hub City Constr. Co., Inc., 433 South Salina St., Syracuse, $92,829 est. $116,628 — Cattaraugus Co., to G. W. Rice, Salamanca, $25,272 est. $34,100. Grand total $307,713. Noted June 5 under "Streets and Roads."

O., Cincinnati—Hamilton Co. 2 span 80 ft. concrete bridge, Lock St., to Erier Co., 4th Natl. Bank Bldg., $25,825. Est. $34,227. Noted June 27 Daily.

Oklahoma and Texas — State Hy. Dpt. of Oklahoma, Oklahoma City, A. R. Losh, hy. engr. and State Hy. Dpt. of Texas, Austin, G. Gilchrist, engr., bridge across Red River from Henrietta, Okla., to Gainesville, Tex., to Missouri Valley Bridge Co., Kansas City, Mo., and Box 921 Dallas, Tex., $320,817. Noted Apr. 10.

Pennsylvania—State Hy. Comn., Harrisburg, two 152 ft. span through truss bridge with 30 ft. roadway, one 5 ft. sidewalk, 1,870 lin.ft. concrete roadway approaches, Route 205, Rouseville Boro, Venango Co., to T. J. Foley Co., 160 South Euclid Ave., Pittsburgh, $104,127.

Texas—G. Gilchrist, state hy. engr., Austin, steel, concrete bridge on Hy. 31, Federal Aid Project 575-F, Navarro Co., to J. B. Clardy Constr. Co., Fort Worth, $91,508. Est. $100,000. Noted June 12.

Tex., Austin—City, c/o A. R. Johnson, mgr., rein.-con. arch design bridge over Waller Creek at 2nd and Red River Sts., to J. F. Johnson, 500 East 3rd St., $30,794. Est. $35,000. Noted June 12.

Virginia—State Hy. Comn., Richmond, bridge over Blackwater River, Southampton Co., to J. S. Bowers, Whiteville, N. C., $17,183; bridge over North River, Rockbridge Co., to A. N. Campbell & Co., Lynchburg, $34,693. Noted June 5.

STREETS AND ROADS

BIDS ASKED

Arizona—July 21, at office State Hy. Comn., Phoenix, grading, surfacing 4 mi. roadway from Fredonia to state line, F. A. P. 95-A. W. W. Lane, state engr.

Ark., Booneville—July 14, by Bd. City Comrs., G. Tatum, secy., grading, curbing, 6 in. rein.-con. paving 33,000 sq.yd. Street Impvt. Dist. 2, incl. Bway., Bennet and Railroad Aves., Main, Cook and 3rd Sts. Dickinson & White, Inc., 710 Rector Bldg., Little Rock, engrs.

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Streets and Roads (Continued)

California—July 23, by C. H. Purcell, engr. State Hy. Comn., Sacramento, grading, bituminous macadam surfacing 1.3 mi. Belvedere Crossing-Tiboron Rd., Marin Co.; grading, concrete paving 3 mi. San Luis Obispo-Cuesta Grade Rd., San Luis Obispo Co.

Calif., Mill Valley — W. Falley, city clk., taking bids grading, vitr. sewers, curbing, concrete and asphaltic paving Corte Madera Ave., et al. To exceed $50,000.

Del., Wilmington—July 21, by Bd. Harbor Comrs., Marine Terminal, C. H. Gant, mgr. and secy., concrete roadways at Unit 2, Wilmington Marine Terminal; adv. E. N.-R. July 10.

Ill., Chicago—July 15, by City, at office Bd. Local Impvts., City Hall, grading, removing old surface, curb and gutter, preparing subgrade, sand filling, curbing, guttering, sewers, relaying old granite block, new granite block, and asphaltic wearing course and binder on present concrete brought to grade with additional concrete paving North Ashland Ave.; removing old surface, curb and gutter, grading, curbing, guttering, sewers, limestone and asphalt on 6 in. concrete paving North La Salle St., also sidewalks and retaining walls. M. J. Faherty, pres.

Ind., Lafayette — July 19, by Bd. Comrs. Tippecanoe Co., concrete surfacing Lettie V. Snideman Rd. C. M. Davis, Lafayette, co. aud.

Ia., Davenport — July 14, by City, grading, concrete paving 7 alleys, Crestline Dr.-Middle Rd., Marlo Ave., 18th St.

Kansas—July 18, by State Hy. Dpt., Topeka, grading, bridging, sand gravel and paving roads in Woodson, Cherokee, Wilson, Greenwood, Neosho, Elk, Montgomery, Linn, Franklin and Labette Counties. W. V. Buck, hy. engr.

Kentucky — July 31, by State Hy. Dpt., Frankfort, grading, drainage structures 4.8 mi. Flemingsburg-Maysville Rd., S. P. 68-A-S, Fleming Co.—1.2 mi. Allen-Lackey Rd., F. R. 19-A-G, Floyd Co., incl. rein.-con. approach spans and substructures for 3 bridges—10 mi. Cynthiana-Brooksville Rd., S. P. 58½ C-G, Harrison Co.—6.3 mi. Richmond-Nicholasville Rd., S. P. 59½, Madison Co.—3.4 mi. Harrisburg-Springfield Rd., F. A. 191-BG, Mercer Co. —5.6 mi. Tompkinsville-Scottsville Rd., S. P. 37-GG, Monroe Co.—6 mi. Carlisle-Flemingsburg Rd., S. P. 43-AG, Nicholas Co.—surfacing 10 mi. Mayfield-Fulton Rd., F. A. 146-A-S, Graves Co., F. A. 146-C-S, Hickman Co.—and F. A. 146-BS, Fulton Co. — 12.7 mi. North Pleasureville-Gratz Rd., S. P. 19-C-S, Henry Co. —14.1 mi. Dixon-Madisonville Rd., S. P. 2-F-S and F. A. 41-AB-S, Hopkins Co., and F. A. 34-D-S, Webster Co.—22.2 mi. West Liberty-Saylersville Rd., F. A. 120 BC-S2, Morgan Co., and F. A. 120-AD-S2, Magoffin Co.—7.3 mi. Bardstown-Loretto Rd., S. P. 206-B-S, Nelson Co.—8.9 mi. Pikeville-Prestonsville Rd., F. A. 132-B-S, Pike Co.—6.5 mi. Pikeville-Whitesburg Rd., F. A. 127-G-S, Pike Co.—12.2 mi. Morehead-Grayson Rd., F. A. 67-A-S, Rowan Co., and F. A. 68-A-S, Carter Co.—5.3 mi. Campbellsville-Greensburg Rd., F. A. 190-A-S, Taylor Co.—0.7 mi. town of Dixon, U. S. Hy. 41, S. P. 2-G-S, Webster Co. B. Johnson, chn.

Louisiana — July 15, by State Hy. Comn., Baton Rouge, grading, structures 6.6 mi. Plain Dealing-Vivian Rd., Route 109, Bossier Parish. H. B. Henderlite, hy. engr.

Ia., Columbus — July 19, by Police Jury Caldwell Co., improving 7.5 mi. Columbia-Copenhagen Rd. and 3.5 mi. Columbia-Hough Rd. Noted June 5.

Maine — July 15, by State Hy. Comn., Augusta, concrete surfacing 4.76 mi. Federal Aid Project 126-A, Cornish, Parsonsfield and Porter—gravel surfacing 1.89 mi. Federal Aid Project 85-E, Charleston—3.67 mi. Federal Aid Project 94-E, Gilead—0.55 mi. Federal Aid Project 99-D, Columbia Falls. F. A. Peabody, chn. Hy. Comn.

Maryland—July 15, by State Roads Comn., Baltimore, sheet asphalt paving 0.44 mi. Contr. BC-91-72, in Baltimore city—concrete paving 4.53 mi. Contr. Ce-80-28 Cecil Co.—1 mi. Contr. F-137-54 Frederick Co.—0.2 mi. Contr. G-59-62 Garrett Co.—graveling 2 mi. Ch-89-34 Charles Co.—3.67 mi. Contr. P.122-84 Prince Georges Co.—and 1 mi. Contr. SM-66-82 St. Marys Co.—concrete paving, concrete shoulders 6 mi. Contr. F-149-511, Frederick Co.—concrete shoulders on 2 mi. Contr. M-156-311, Montgomery Co. G. C. Uhl, chn; adv. E. N.-R. July 10.

Massachusetts — July 15, by Dpt. P. Wks., Boston, bituminous macadam paving 38,078 ft. hy. Becket and Lee; rein.-con .and bituminous macadam paving 24,257 ft. hy. Andover and North Andover. A. W. Dean, Dpt. P. Wks., Boston, engr.

Massachusetts—July 15, by Dpt. P. Wks., Boston, bituminous macadam paving 34,716 ft. hys. in Dudley, Southbridge, West Springfield, Spencer, Sharon, Hanson; rein.-con. widening 18,000 ft. hy. Attleboro and North Attleboro. A. W. Dean, Dpt. P. Wks., engr.

Mass., Boston—July 14, by Dpt. P. Wks., recut granite block paving Ward 3. $25,000. J. A. Rourke, comr.

Mass., Boston—July 15, by Dpt. P. Wks., sheet asphalt or bitulithic paving Warren St., Ward 21. $35,000. J. A. Rourke, comr. Dpt. P. Wks.

Michigan—July 15, at City Clerk's Office, Sault Ste. Marie, grading, draining, concrete

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paving 0.57 mi. MO17-22-Contr. 1; city of Sault Ste. Marie, Chippewa Co., 20 ft., for State Hy. Comn., Lansing. E. H. Hoahr, Newberry, resident engr.

Michigan—July 16, by L. N. Jones, resident engr., Crystal Falls, grading, shaping, drainage structures, concrete paving 6.868 mi. MO31-21, Contr. W. Houghton Co., for State Hy. Comn., Lansing.

Michigan—July 23, by C. L. Cowgill, resident engr., Plymouth, grading, concrete surfacing 0.256 mi. A.D.294-Contr. 2, Oakland and Washtenaw Counties, 20 ft., for State Hy. Comn., Lansing.

Minnesota—July 22, by State Hy. Dpt., St. Paul **(S.P. means State Project)**, concrete paving 10.9 mi. S.P. 7-42, Divs. A and B—0.8 mi. S.P. 11-40—grading 6.5 mi. S.P. 3-61—7.5 mi. S.P. 5-39—6.4 mi. S.P. 5-40—9.5 mi. S.P. 8-35 —7.2 mi. S.P. 14-27—9.6 mi. S.P. 20-25. J. T. Ellison, ch. engr.

Minn., Willmar—July 15, by J. W. Haines, aud. Kandiyohi Co., grading, overhauling, portable culverts 13 mi. Job 3002, A, B and C, State Aid Roads 18 and 19. $30,000.

Mo., St. Louis—July 15, by Bd. P. Serv., City Hall, curbing, asphalt paving 15,660 sq.yd. McLaran Ave., $111,840; 3 in. brick on concrete paving Lee Ave., $3,800. W. W. Horner, city engr.

New Hampshire—July 17, by State Hy. Dpt., 3 in. on 6 in. gravel surfacing 18,070 cu.yd. Bakers Pond Rd., Oxford, $17,000; 6 in. one course rein.-con. on 8 in. gravel paving 60,898 sq.yd. Lafayette Rd., Seabrook, Hampton and Falls, $221,000.

N. J., Belvidere—July 23, by Bd. Freeholders Warren Co., Court House, grading, and 40 ft. span concrete bridge on Riegelsville Extension. H. W. Vetter, Court House, co. engr.; adv. E. N.-R. July 10.

N. J., East Orange—July 14, by City Council, City Hall, grading, curbing, 2 in. National, 2 in. warrenite bitulithic or sheet asphalt on 6 in. concrete paving Chestnut, North Sterling and Main Sts. $50,000. E. Willegerod, city engr.

N. J., Morristown—July 23, by Bd. Freeholders Morris Co., Court House, reconstructing portion Madison-Hanover Rd., Boro Florham Park. W. Hopkins, co. engr.

N. J., Newton—July 15, by Bd. Educ., Franklin Boro, grading, sidewalks, concrete paving 2,559 sq.yd. School St.—2,899 sq.yd. School St. and Wildcat Rd.—3,620 sq.yd. Junction and Fowler Sts. Snook & Hardin, 35 Spring St., engrs.; adv. E. N.-R. July 10.

N. J., Rutherford — July 15, by Bd. Boro Council, Boro Hall, grading, widening, paving Erie Ave. W. G. Ihnen, 17 Ames Ave., engr.

New York—July 22, by A. W. Brandt, comr. Hys., Albany, improving hys. in Hamilton, Broome, Columbia, Erie, Franklin, Herkimer, Steuben, St. Lawrence, Tioga, Ulster and Westchester Counties; adv. E. N.-R. July 10.

N. Y., Long Island City—July 14, by G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., grading Caney Lane—asphalt paving 30th and 103rd Sts.—grading, curbing, sidewalks, sheet asphalt on concrete paving Bell Blvd., 86th Rd., 94th, 29th, 132nd, 58th Sts., Catalpa and 34th Aves.

N. Y., New York—July 15, by H. Bruckner, pres. Bronx Boro, Crotona Park, 3rd and Tremont Aves., grading, culverts on Eastern Blvd.—sheet asphalt on concrete paving Pelham Parkway East 196th St., Baychester Ave.—sheet asphalt and bituminous concrete on concrete paving Johnson Ave.—curbing, sidewalks on grading, curbing, sidewalks, bituminous concrete on concrete paving Prospect Pl.—Fenton Ave.

O., Miles Heights (br. Cleveland)—July 14, by Village, vitr. brick, concrete or asphaltic concrete paving East 153rd, 154th and 155th Sts., Starr and Emery Aves. To exceed $75,000. East End Eng. Co., Town Hall, engrs.

O., Parma (br. Cleveland)—July 16, by Village, paving West 46th St., Broadview Rd. and Milford Ave. To exceed $25,000.

O., Portsmouth—July 11, by City Council, asphalt resurfacing Finley and 8th Sts., $28,000. C. S. Stevenson, engr.

Pa., Glassmere—July 15, by W. L. Orris, secy. Bd. County Comrs. East Deer Twp., grading, curbing, sewer inlets, sidewalks, paving 4,000 sq.yd. Marion, 2nd, 3rd and Edna Sts., in East Deer Twp. R. M. Douglass, 912 Columbia Bank Bldg., Pittsburgh, engr.

Pa., Waynesburg—July 18, by D. J. Yoders, secy. Bd. Supervs. Morgan Twp., R. D. 1, furnishing, spreading, rolling in place 3,500 tons air cooled slag Penna 5 and 1,050 tons limestone screenings, Penna 1, on 7.248 ft. Clarksville Boro Line Rd. Private plans.

Rhode Island—July 16, by State Bd. P. Roads, Providence, **(F.A.P. means Federal Aid Project)**, rein.-con. paving 6 mi. F.A.P. 61-B, Contr. 3021, Johnston and Scituate, 40 ft.—bituminous macadam paving 2.3 mi. F.A.P. 62, Contr. 3028, Hopkinton, 20 ft.—1.7 mi. F.A.P. 63, Contr. 3014, Cumberland, 20 ft.; adv. E. N.-R. July 10.

Tex., Dallas—July 28, (extended date), by Dallas Co., c/o C. E. Gross, aud., inverted penetration type surfacing 15.5 mi. roads, 18 ft. Rollins & Clinger, Hall of Records Bldg., dist. engrs.

Tex., Houston—July 16, by City and Harris Co., c/o W. E. Monteith, mayor, 2½ in. brick paving 26,300 sq.yd. or asphalt on 6 in. concrete paving 24,850 sq.yd. Washington Ave. from Yale to Reinerman Sts. $50,000. J. M. Nagle, Houston, engr.

Tex., Lockhart — Caldwell Co. taking bids hard-surfacing 7 mi. Hy. 29 from point north of here to Travis Co. line 18 ft. $90,000. M. Swain, Caldwell, co. engr.

Tex., Mount Vernon—July 15, by City, c/o W. J. Moore, mayor, rein.-con. or brick paving 9,151 sq.yd. $30,000. Montgomery & Ward, Wichita Falls, engrs.

Tex., Spearman — Montgomery & Ward, engrs., 544 Harvey-Snider Bldg., Wichita Falls, taking bids concrete or asphaltic paving 11,290 yd., for City. $28,000.

Tex., Victoria—July 15, by S. S. Sitterle, mayor, grading, curbing, culverts, concrete and terra cotta pipe, paving 19,755 sq.yd.

Washington—July 22, by Dpt. Hys., S. J. Humes, dir., Olympia, crushed stone surfacing 3.6 mi. State Rd. 8, Skamania Co.—constructing 190 ft. timber pile trestle over Nason Creek, Chelan Co.—stockpiling, crushed stone resurfacing, 18,120 cu.yd. Stevens Pass Hy., King and Chelan Counties.

Wash., Seattle—July 21, by Comrs. King Co., grading, graveling 2.25 mi. M. E. Neal Highway, Lake Killarney, 20 ft. T. D. Hunt, Seattle, co. engr.

W. Va., Beckley—July 15, by City Council, improving City Ave., Reservoir Rd., and 4 streets. H. M. Scott, city engr.

W. Va., Wheeling—July 15, by Bd. Comrs. Ohio Co., D. A. Taylor, clk., grading, stone surfacing 3,800 ft. Waddles and Wardens Run Rd. W. Stegman, engr.

CONTRACTS AWARDED

Arizona—State Hy. Comn., Phoenix, grading, concrete surfacing 4 mi. Holbrook-Winslow Hy., F.A.P. 40-C, Navajo Co., to Tenny & Black, Clifton, $34,461.

Ariz., Chandler—For 6 in. concrete paving Dist. 4, to O. F. Fisher, Phoenix, $64,079.

Ark., Fort Smith—Paving Dist. 44, grading, curbing, guttering, concrete paving 4,810 sq.yd., to McEachin & Luke, Fort Smith, $13,021. Noted June 19.

Ark., Magnolia—Improving streets in Dists. 6, 7 and 8, to Hartman-Clark Bros., Peoria Life Bldg., Peoria, Ill., $50,500.

California — State Hy. Dpt., Sacramento, grading, bituminous treated waterbound macadam surfacing 2.6 mi. road in Santa Cruz Co., to O. A. Lindberg, 448 North American St., Stockton, $127,229 — grading, untreated crushed gravel or stone surfacing 1.8 mi. French Camp - Stockton Rd. and grading, widening, concrete on crusher run base surfacing 3.3 mi. Husten School-Forest Lake Rd., San Joaquin Co., to Larsen Bros., Galt, $42,828 and $37,726 respectively. Grand total $207,783. Noted June 5.

California—State Hy. Comn., Sacramento, grading, asphaltic concrete surfacing over existing 20 ft. wide pavement and widening with concrete to minimum width 30 ft., 4.9 mi. San Antonio Avenue-Sunnyvale Rd., Santa Clara Co., to Hanrahan Co., Standard Oil Bldg., Sacramento, $204,904. Noted May 29.

Calif., Colusa — Colusa Co., 6,300 tons asphaltic paving Mills Orchard Hy., to W. H. Larsen, Sacramento, $39,542.

Calif., Los Angeles—Los Angeles Co., grading, curbing, guttering, concrete paving Manchester Ave., Playa del Rey Blvd., and grading, concrete paving 8th St., to Griffith Co., Railway Bldg., $499,441 and $571,591 respectively. Noted June 12.

Calif., Los Angeles—Los Angeles Co. grading, curbing, guttering sewers, 3 in. oiled macadam surfacing 171,090 sq.ft. and oil and rock wearing surfacing 1,610 sq.ft. Castle Rd., to A. O. Nelson, 126 North Huntington Dr., Passadena. $27,230.

Calif., Los Angeles—Bd. P. Wks., City Hall, grading, curbing, guttering, sidewalks, bitulithic paving Sunset Blvd., to N. F. Crawford, 6900 Washington Blvd., Culver City, $563,648—grading, walks, sewers, 6 and 8 in. concrete paving Main St. and 90th Street Impvt. Dist. and grading, 8-6-6-8-in. concrete paving 275,000 sq.ft. 116th St., to G. H. Oswald, 364 East 58th St., $426,130 and $94,955 respectively — grading, curbing, concrete paving 300,000 sq.ft. Plummer St., to Gibbons & Reed, 221 East San Francisco Blvd., Burbank, $72,995 — grading, durite asphaltic concrete paving 67,000 sq.ft. 257th St., to Curtis Paving Co., 2440 East 26th St., $31,075. Grand total $1,188,803. Noted May 29.

Calif., Pasadena — Grading, curbing, 7 in. concrete paving 120,000 sq.ft. Walnut St., to J. E. Haddock, 357 North Chester St., $72,455.

Calif., Santa Clara—Grading, asphaltic concrete paving Union Ave. and Bellomy St., to Union Paving Co., Call Bldg., San Francisco. $31,310.

Conn., Stamford—Asphaltic concrete paving 23,500 sq.yd. Mayapple Rd. and Rock Rimmon Rd., to T. F. Foley Co., Inc., 77 Day St., South Norwalk, $92,958. Est. $100,000.

Florida—State Road Dpt., Tallahassee, broken stone paving 9.14 mi. P. 714, Union Co., to F. W. Long & Co., Consolidated Bldg., Jacksonville, $80,156; 3.5 mi. P. 911, Bradford Co., to Duval Eng. & Contg. Co., Dyal Upchurch Bldg., Jacksonville, $21,881. Noted June 12.

Streets and Roads (Continued)

Georgia—J. W. Barrett, engr., East Point, grading, bridging 7.647 mi. hy. Grady Co., to Pittman Constr. Co., Rhodes Bldg., Atlanta, $46,593—paving 7.867 mi. Cobb Co., to Whitley Constr. Co., Atlanta, $161,156—6.575 mi. Pike Co., to Noonan Constr. Co., Pensacola, Fla., $153,815—13.338 mi. Houston Co., to Wesco Co., Volunteer Bldg., Chattanooga, Tenn., $259,225—9.433 mi. Barrow and Jackson Counties, to MacDougald Constr. Co., 289½ Peachtree St. N. E., Atlanta, $228,771—16.75 mi. Bullock Co., and surface treating 0.576 mi. Houston Co., to Campbell Constr. Co., Columbus, $354,857 and $19,163 respectively—surface treating 14.646 mi. Lowndes Co., to Duvall Eng. & Contg. Co., Jacksonville, Fla., $233,981. Grand total $1,457,561. Noted May 22 and June 19.

Idaho — J. D. Wood, comr. P. Wks., Boise, grading, graveling 4.808 mi. North Side Hy., Jerome Co., to Sutherland & Burns Constr. Co., Missoula, Mont., $21,498; 3.589 mi. State Line Hy., Bear Lake Co., to Robinson Constr. Co., Twin Falls, $52,989. Noted June 5.

Idaho, Boise—Bd. P. Wks., warrenite bitulithic resurfacing Warm Springs Ave., to Morrison-Knudsen Co., Boise, $26,097.

Ill., Edwardsville — Grading, curbing, concrete paving Steinmeyer Pl., to C. F. Mindrup, Edwardsville, $22,859. Est. $25,000.

Ind., Indianapolis—Dpt. P. Wks., City Hall, grading, curbing, guttering, sheet ashalt paving 9,557 sq.yd. North Delaware St. and Fall Creek Blvd., to Standard Paving Co., 1100 Burdsal Parkway, $26,199. Est. $34,773. Noted June 19.

Ind., Indianapolis — Marion Co., grading, 3 bridges, changing creek channel, 114 cu.yd. concrete headwalls, concrete surfacing 31,955 sq.yd. Arlington Ave., to Indiana Asphalt Paving Co., 2810 Columbia Ave., $69,100. Est. $105,863. Noted June 12.

Ind., Indianapolis—Marion Co., grading, 2 bridges, channel change, guard rails, concrete headwalls, rolling sub-grade, concrete surfacing 71,968 sq.yd. Shelbyville Rd., to J. R. Hiatt Co., 40 East 54th St., $153,292. Est. $213,517. Noted June 19.

Ind., Laporte—Laporte Co., concrete surfacing F. C. Eastwood Rd., to Cook Bros., Laporte, $35,836; gravel surfacing Schirr Rd., to Harshman & Jarreli, Frankfort, $20,370.

Ia., Dubuque—Dubuque Co., grading 11 mi. roads, to J. P. Hurley, Epworth, $27,484; 18 concrete box culverts, 6 extensions, to J. B. Elliott, Independence, $11,480.

Ia., Marion—Curbing, guttering 6 in. rein.-con. paving 17,400 sq.yd., to Haegg Constr. Co., Cedar Rapids, $33,558. Noted June 19.

Ia., Ottumwa—City Clerk, 6 in. rein.-con. on 5 in. concrete paving 14,840 sq.yd. Williams St., to J. C. Blunk Constr. Co., Ottumwa, at $2.07 per sq.yd.

Ia., Pocahontas — Pocahontas Co., grading 20.5 mi. local roads, to G. Little, Humboldt. L. J. Hartman and W. C. Beckwalter, both Laurens.

Ia., Sioux City—Woodbury Co., grading 7.2 mi. trunk roads, to W. H. Dugan & Sons, Omaha, Neb., $38,767. Noted June 12.

Kansas—State Hy. Comn., Topeka **(P. means Project)**, to F. Eberhardt Paving Co., Salina, sand gravel or chats surfacing 3.863 mi. P. 50N-25-FA 257-D, $6,722, 5.565 mi. P. 50N-25-FA 257-F $9,683, 5 mi. 50N-25-K 1004 $8,000, 12.43 mi. P. 50N-22-FA 317-B $21,699; 8.181 mi. P. 50N-22-FA 317-C $13,942, all Marion Co.—to Reed & Wheelock, Clay Center, concrete surfacing 0.62 mi. P. 40N-22-FA 284-E, $15,958, sand gravel or chats surfacing 7.632 mi. P. 40N-22-K $13,981, 5.261 mi. P. 40N-22-FA 234-D $8,280, all Cloud Co. to Western Bridge & Constr. Co., 3867 Leavenworth St., Omaha, Neb., 6.502 mi. P. 77-16-FA 228-D $11,151, 5.334 mi. P. 77-16-FA 228-E $9,076, 2 mi. P. 77-16K-1067 $3,456, all Dickinson Co.—to Dan Scherrer, 329 North 18th St., Kansas City, 1 mi. P. 36-16K-1068 $1,680; 8.538 mi. P. 36-16-FA 364-E $14,344; 2.161 mi. P. 36- 18 and 19-FA 272-D $3,632, all Jewell Co.—to Cook & Cone, Ottawa, 0.719 mi. P. 77-12-K 1066 $1,190; 0.327 mi. P. 77-12-K 1065 $549; 4.579 mi. P. 77-12-FA 226-B $10,052, all Marion Co.—to W. D. Shay, McPherson, 6.155 mi. McPherson Co., $9,897—to San Ore Constr. Co., McPherson, 7.543 mi. McPherson $12,220—to S. W. Poor, 927 Lincoln St., Topeka, grading 0.454 mi. bridge approach in Marion Co. $11,512. Grand total $187,324.

Kansas—State Hy. Comn., Topeka, **(P. means Project)** to Mead & Hardman, Alton, grading 1.565 mi. road in Decatur Co. $10,248; multiple box span bridge on same road $2,788; 8.62 mi. Osborne Co. $31,898; ten bridges on same road $33,285; 0.217 mi. P. 40-N-8-FA 318-A $1,648, bridge on same road $11,907; 1.959 mi. P. 40-N-8-FA 318-D, $9,947, 2 bridges on same road $5,114, all Sheridan Co.—to D. G. Hanson, Logan, sand gravel or chats surfacing 2.995 mi. Norton Co. $5,373; 5 mi. Project 56-11-E975 Phillips Co. $8,970—to M. W. Watson, Mulvane Bldg., Topeka, 13.27 mi. Phillips Co. $25,478—to D. H. Hardman, Alton, local limestone surfacing 3.996 mi. Project 36-15A-FA 193-A $9,291; 4.001 mi. P. 36-13-FA 212-A $9,281; 8.407 mi. P. 36-14-FA 364-A $19,610; 2.066 mi. P. 36-15A-FA 364-D $4,819; 2.095 mi. P. 36-15A-FA 364-D $13,116—0.265 mi. P. 36-15A-K 1055 $619, all Smith Co.—to San Ore Constr. Co., McPherson, graveling 4.5 mi. P. 40S-3-7043 Logan Co. $2,070; 18.25 mi. P. 40S-4-7042 Logan Co. $8,395; 22 mi. Rawlings Co. $15,488; Russell Co. $10,120; 8 mi. Trego Co. $4,160. Grand total $243,625.

Kan., Dodge City — For 2½ in. brick surfacing 22,000 sq.yd. and 3 in. brick surfacing 5,000 sq.yd., to Geiger & Rutherford, Leavenworth.

Kan., Ottawa — Franklin Co., grading, sand graveling 5.53 mi. Sand Creek Rd., to A. L. Cook, Ottawa, $28,157.

Kan., Scott City—Concrete paving 19,000 sq.yd., North Main and Court Sts., to Cook & Ransom, Ottawa.

Kentucky—State Hy. Dpt., Frankfort, waterbound macadam surfacing 4.492 mi. roads in Boyle Co., to J. S. Lancaster & Bros., Georgetown, $57,615—rock asphalt on limestone surfacing 12.971 mi. Christian and Todd Counties, to E. L. Traughber, Elkton, $239,049—9.364 mi. Logan Co., to Gorrell, Barrow & Kirkpatrick, Russellville, $167,169—traffic bound limestone surfacing 17.955 mi. Green and Adair Counties, to Wilmore Constr. Co., Wilmore, $87,446 — 19.469 mi. Harlan and Letcher Counties, to Kaiser Transportation Co., Buechel, $159,217—rein.-con. surfacing 18,607 mi. Lawrence Co., to Hunt-Forbes Constr. Co., Ashland, $381,921—retread limestone surfacing using light tar and asphalt cut back 10.291 mi. Meade and Breckinridge Counties, to McLellan & Campbell, Bowling Green, $126,853—7.487 mi. Washington and Marion Counties, to F. G. Vreslin, 32nd and Market Sts., Louisville, $48,987—grading, drainage structures 4.677 mi. Carroll Co. and 6.542 mi. Gallatin Co., to Southeastern Constr. Co., Eminence, $65,338 and $131,142 respectively—2.573 mi. Hopkins Co., to Corum Bros., Madisonville, $22,223 — bridges, culverts in Webster Co., to Ruby Lumber Co., Providence, $31,201. Grand total $1,518,161. Noted May 15.

Kentucky—State Hy. Dpt., Frankfort, rein.-con. surfacing 6.178 mi. Fulton-Clinton Rd., Fulton Co. and 6.432 mi. Paducah-Mayfield Rd., McCracken Co., to Nelson Bros., Columbian Mutual Bldg., Memphis, Tenn., $125,749 and $141,555 respectively; retread on limestone surfacing, using light tar and asphalt 1.767 mi. Whitley City-Tennessee State line Rd., McCreary Co., to Carey-Reed Co., Lexington, $29,682. Grand total $296,986. Noted June 6 and June 19 under "Contracts Awarded."

La., Monroe—City Council, grading, concrete paving Lee Ave., South Grand and Jackson Sts., to M. Hyman, Monroe, $262,189.

Maryland—State Roads Comn., Baltimore, concrete paving 1.51 mi. Caroline Co., to Highway Eng. & Contg. Co., Selbyville, $26,270—1.19 mi. Dorchester Co. and 1 mi. Cecil Co., to P. D. Phillips & Bro., Salisbury, $28,252 and $16,343 respectively. Noted June 5.

Maryland — State Roads Comn., Baltimore, graveling 1.5 mi. Charles Co., to Southern Maryland Contg. Co., 20 East Lexington St., Baltimore, $13,393—concrete paving 1.23 mi. Dorchester Co., to P. D. Phillips & Bro., Salisbury, $16,758—1.01 mi. Baltimore Co., to P. Reddington & Son, 2 East Lexington St., Baltimore, $35,118. Grand total $65,269. Noted June 6 Daily.

Maryland — State Roads Comn., Baltimore, concrete paving 0.5 mi. Washington Co., to Long Tenny Co., Hagerstown, $14,070—0.84 mi. Talbot Co., to P. D. Phillips & Bro., Salisbury, $19,559—graveling 1.5 mi. Charles Co., to Jarboe & Haughton, Mechanicsville, $13,333—concrete shoulders on 0.77 mi. Garrett Co., to J. W. Wharton, Oakland, $4,895. Grand total $51,857. Noted June 30 Daily.

Maryland — State Roads Comn., Baltimore, macadam paving 1 mi. Carroll Co., to T. E. Russell, Frederick, $17,950. Noted May 22.

Massachusetts—Dpt. P. Wks., Boston, rein.-con. paving 11,715 ft. Sect. A. Boston-Worcester Turnpike, in Shrewsbury, to Lane Constr. Corp., 134 State St., Meriden, Conn., $426,855; 23,860 ft. Sect. C. Boston-Worcester Turnpike, in Westboro and Southboro, to B. Perini & Sons, Ashland, $779,213. Noted June 26.

Massachusetts—Dpt. P. Wks., Boston, bituminous macadam paving 2,200 ft. hy. Oxford, to Frank & Frank Constr. Co., 9 Doyle Ave., Providence, R. I., $12,761—bitulithic concrete paving 4,735 ft. hy. West Bridgewater, to Washburn & Sheridan, East Taunton, $16,145—rein.-con. paving 1,600 ft. Athol, to R. E. Bull, 151 Harrison Ave., Fitchburg, $16,124—gravel and bituminous macadam paving 3,525 ft. hy. Sharon, to Arute Bros., 499 South Main St., New Britain, Conn., $10,977. Grand total $56,007. Noted June 19.

Mass., Boston—Dpt. P. Wks., sheet asphalt paving South St., Ward 20, to J. J. McCarthy & Co., 121 Boston St., Dorchester, $35,395. Noted June 19.

Mass., Boston—Dpt. P. Wks., sheet asphalt paving Weld St., Ward 20, to C. Capone, 11 Hemlock St., Roxbury, $35,143. Noted June 19.

Mass., Brookline—Bd. Selectmen, sheet asphalt paving Beacon St., to J. McCourt Co., 910 Huntington Ave., Boston. Est. $25,000. Noted June 12.

Michigan — At office G. H. Greene, resident engr., Alpena, grading, shaping, concrete paving 9.05 mi. FO8-12C-1, Arenac Co., 20 ft., for State Hy. Dpt., Lansing, to Whitlow & Hobeck, South Haven, $326,038. Noted June 19.

Michigan — R. R. Havens, resident engr., Jackson, concrete surfacing, 0.439 mi. Rd. FO46-13, Contr. 7, Lenawee Co., for State Hy. Dpt., Lansing, to Lewis & Frisinger, Ann Arbor, $21,486; grading same to State Constr. Div., Lansing, $13,380.

Michigan — G. D. Tramp, resident engr., Crystal Falls, gravel resurfacing 20.1 mi. MO31-6, Contr. 5, Houghton Co., to I. L. Whitehead, Sault Ste. Marie, for State Hy. Dpt., Lansing, $29,600. Noted May 22.

Mississippi—State Hy. Comn., Jackson, graveling 7.237 mi. State Project 1005, Corinth-Memphis Hy., Tippah Co., to Clark & McCaa, Jackson, $53,266. Noted June 12.

Miss., Tunica—Bd. Aldermen, curbing, guttering, concrete paving 5,590 sq.yd. Edwards Ave., to Rast, Griffith & Jones Corp., 3024 South 20th St., Birmingham, Ala., at $1.82 per sq.yd. Noted June 12.

Mo., Bonne Terre—Improving streets, to Service Constr. Co., Popular Bluff. Est. $25,000.

Nebraska — State Hy. Dpt., Lincoln, paving 3.2 mi. paving Lincoln Co. and 6.7 mi. Lancaster and Cass Counties, to Western Asphalt Paving Corp., Sioux City, Ia., $79,421 and $145,775 respectively.

New Hampshire—State Hy. Dpt., Concord, 3 in. on 6 in. gravel paving 12,221 cu.yd. New Hampshire College Rd., Nottingham-Barrington, to C. E. Horne, Millbury, Mass., $42,055. Est. $65,000. Noted June 19.

N. J., Ocean City—Bd. City Comrs., City Hall, grading, sheet asphalt paving 10th St., to E. Riley Mixer, Ocean City. Est. $25,000.

N. J., Trenton—City Comn., asphalt paving Greenwood Ave. and Chamber St., to Union Paving Co., 123 South 21st St., Phila., Pa., $34,012—Home Ave. and High St., to Eastern Asphalt Co., Penna. Bldg., Phila., Pa., $24,496—Green Pl., to Ross & Taylor, Mechanic Bldg., Trenton, $1,400—Huston Alley, to P. DiAntonia, 224 East Hanover St., $4,762—Morton Alley, to Agabiti Bros., 125 Swan St., $2,943—Zelley Alley, to A. DeLucia, 52 Bayard St., $2,532. Grand total $70,145. Noted June 19.

New York—A. E. Brandt, comr. Hys., Albany, concrete paving 4.24 mi. road in Tioga Co., and 3.68 mi. Clinton Co., to G. Edgecomb Co., Inc., Walton, $218,740 and $143,982 respectively, est. $273,205 and $185,752 respectively—8.98 mi. Oneida Co., to Dale Eng. Co., 404 Court St., Utica, $318,083 est. $439,991—5.01 mi. Suffolk Co., to D. Kraft, Oyster Bay, $127,906 est. $165,502—2.34 mi. Suffolk Co., to Connor Bros., Long Beach, $224,506 est. $285,455—bituminous macadam paving 0.59 mi. Broome Co., to L. D'Angelo, Binghamton, $63,841 est. $91,798—cable guide rail, Queens Co., to L. S. Lee, Oaks Corners, $1,373 est. $1,725—bituminous macadam paving 1.8 mi. Steuben Co., to W. L. Collins, Hornell, $168,368 est. $219,101. Grand total $1,266,799. Noted June 5.

N. Y., Brooklyn — H. Hesterberg, pres. Brooklyn Boro. Boro Hall, to Leonard Paving Co., 233 Bway., New York, granite block paving Bush St., $6,808; Lorraine St., $73,935—to P. J. Doyle, grading Beverly Rd., $3,761—to A. Suriano, foot 24th Ave., Dahill Rd., $3,747; Foster Ave., $7,229; 74th St., $2,494—to Cranford Co., 52 9th St., resurfacing Albany Ave., $133,840—to B. Turecamo, New Cropsey Lane, asphalt paving Dahill Rd., $10,170; East 32nd St., $3,553; Narrows Ave., $4,879—to J. J. McCoy Asphalt Co., Avenue U and East 57th St., Avenue K $14,008; Rockaway Ave. $28,349—to Brooklyn Alcatraz Asphalt Co., 407 Hamilton Ave., Nostrand Ave., $43,724; 84th St., $7,409. Grand total $443,906. Noted May 29.

N. Y., New York—J. Miller, pres. Manhattan Boro. Municipal Bldg., curbing, recurbing, sidewalks, sheet asphalt on concrete paving Bennett Ave., to Valatia Constr. Co., 15 East 40th St., $48,389. Noted June 19.

N. Y., St. George—J. A. Lynch, pres. Richmond Boro. Boro Hall, grading, bituminous repaving Nicholas Ave. and Tysen Sts., to J. E. Donovan, 2205 Richmond Terrace, Port Richmond, $24,265 and $19,143 respectively. Noted May 29.

O., Cincinnati—Concrete paving 3,600 sq.yd. Kleemeier St. from Liberty to Latham Sts., to A. J. Henkel Constr. Co., 604 Vine St., $25,850. Est. $26,618.

O., Cincinnati—C. O. Sherrill, city mgr., City Hall, grading, walks, sidewalks, curbing, concrete paving 7,400 sq.yd. Amazon Ave., to S. A. Ruebel & Co., 4329 Kirby Rd., $48,613 est. $61,285.

O., Cincinnati — Hamilton Co., grading tar bound macadam paving 30,000 sq.yd. River Rd., to D. C. Brunson, Sheridan Dr., Norwood, $54,404. Est. $74,331. Noted June 27 Daily.

O., Cleveland—Brick paving Harvard Ave., to Enterprise Paving & Constr. Co., 8444 Bway., $64,127—Sprecher Ave., to Roehl Bros., 7002 Dennison Ave., $24,660—East 165th St., to Gould & Maybach, 16311 Saranec Rd., $5,406. Grand total $94,193. Noted June 5.

O., Columbus—Franklin Co., F. L. Donnally, clk., grading, curbing, rein.-con. paving 0.784 mi. Kanawha Ave. Rd., in Sharon Twp., 27 ft., to A. G. Pugh, 180 North High St., $37,603. Noted June 12.

O., Hudson—Stone curbing, sheet asphalt paving Lake Forest Ave., to McCourt Constr. Co., 369 South Main St., Akron, $35,738 est. $35,000.

O., Toledo—W. T. Jackson, mayor, and W. H. Schroeder, service dir., concrete guttering, sheet asphalt paving Collingwood Ave., to Harris & Tansey, Security Bank Bldg., $82,308—sheet asphalt paving Eleanor Ave. from Lewis Ave. to Bennett Rd., section North Haven Ave. and Burnham Ave. from Dryden Dr. to Eleanor Ave., to S. E. Johnson Co., Lasky Rd., $51,848—Southmoor Dr. from Detroit Ave. to Lomond Dr., to Continental Bitumen Co., 2463 Bway., $13,660—asphalt block paving Cottage Ave., Weber St. to Oakland Ave. and brick paving Torrey Ave. from West Bancroft St. to Ottawa Dr., to McKenchnie-Pierce Co., Nicholas Bldg.,

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Streets and Roads (Continued)

$4,006 and $21,106 respectively—concrete paving Lucas St. from Junction Ave. to Hoag St., to Peters Bros. Co., Toledo, $10,785—brick approaches to South Ave. Bridge and paving alleys between Lawton St., Detroit Ave., Lamson St. and Delaware Ave., to Launder & Son, Inc., 232 Vine St., $6,868 and $3,569 respectively—paving alley west of Plymouth St. to Delence St. and alley between Greenwood Ave., Parker, Mason and White Sts., to J. H. Horan, $438 and $4,845 respectively—alley between Nesslewood Ave., and Ambia St. and alleys between Putnam, Warren, Winthrop and Machen Sts., to J. V. Rush, 2145 Central Grove Ave., $4,279 and $8,819 respectively—alley between Felt, Oak, Rall and Hathaway Sts. and one southwest of Chicago St. between Champlain and Michigan Sts., to Thacher Bros. Contg. Co., 108 Jefferson St., $4,913 and $1,262 respectively. Grand total $218,706.

Pennsylvania—State Hy. Comn., Harrisburg, grading, concrete surfacing 57,500 sq.yd. Greene Co., to Tri State Eng. Co., Cumberland, Md., $357,536—42,000 sq.yd. Westmoreland Co., to Corrado & Gallardi Constr. Co., Connellsville, $232,869 — 66,500 sq.yd. Luzerne Co., to Raffaeli Mazzoni, West New York, N. J., $636,551 — 21,450 sq.yd. Allegheny Co., to D. W. Challis & Sons Co., Sewickley, $100,350—57,200 sq.yd. Lehigh Co., to Johnson, Drake & Piper, Freeport, N. Y., $297,582—14,400 sq.yd. Fayette Co., to T. J. Foley, 160 South Euclid Ave., Pittsburgh, $198,466 — 23,500 sq.yd. Schuykill Co., to Correcale Constr. Co., Hazelton, $172,325—concrete surfacing 57,707 sq.yd. Snyder Co., to Sherman & Rhodes, Lewistown, $158,576—33,838 sq.yd. Somerset Co., to Harrison Constr. Co., 2101 Sidney St., Pittsburgh, $115,112—grading, concrete surfacing 6,055 sq.yd., waterbound macadam surfacing 4,465 sq.yd., and vitr. brick on concrete surfacing 23,300 sq.yd. Allegheny Co., to M. Parrish Constr. Co., Jones Law Bldg., Pittsburgh, $827,687—grading, waterbound macadam surfacing 23,332 sq.yd. Lycoming Co., to F. P. Kessler, Northumberland, $162,566. Grand total $3,529,620. Noted June 5.

Pennsylvania—State Hy. Comn., Harrisburg, grading, concrete surfacing 17,100 sq.yd. Route 429, Sect. 18, Nicholson Twp., Fayette Co., to A. G. Rothy, Elizabeth, $162,408; grading 28,000 cu.yd. Route 31, Richland Twp., Venango and Clarion Counties, to Lincoln Constr. Co., Youngstown, O., $40,460. Noted June 5.

Pennsylvania—State Hy. Comn., Harrisburg, grading, concrete surfacing 14,200 sq.yd. Route 286, Blair and Taylor Twps., Blair Co., to E. H. and L. A. Brua, Hollidaysburg, $142,378. Noted May 8.

Pennsylvania—State Hy. Comn., Harrisburg, grading, rein.-con. surfacing 12,809 sq.yd. Application 6850, East Union Twp., Schuylkill Co., to A. A. White Co., Lebanon, $85,028. Noted Apr. 10.

Pa., Erie—Rein.-con. paving Glenwood Park Ave., West 41st, 26th and Peach Sts., to Lewis & Copeland Constr. Co., Lima, O., $106,123.

Pa., Pittsburgh—Grading, sandstone curbing, guttering, sewers, 675 sq.yd. sidewalks, sheet asphalt paving 2,570 sq.yd. Bennett St., to A. F. Jordano, 1201 West Liberty Ave., $62,453. Est. $85,000.

South Dakota—State Hy. Comn., Pierre, to S. J. Groves & Co., 306 Globe Bldg., Minneapolis, Minn., resurfacing 28.31 mi. Stanley Co. $51,633; 11.552 mi. Lawrence Co. $10,014; 11.921 mi. Lawrence and Mead Counties $8,398; 27.199 mi. Pennington and Jackson Counties $35,872; 15.732 mi. Butte and Lawrence Counties $13,671; 29.406 mi. Jones and Lyman Counties $38,372—to Goble Constr. Co., Rapid City, 19.767 mi. Meade Co. $32,808—to J. L. Healy, Manchester, 15.777 mi. Davison Co. $14,056 — to Summit Constr. Co., Summit, 24.188 mi. Aurora Co. $22,215; 35.379 mi. Davison and Hutchinson Counties $48,548—to T. J. Tobin Constr. Co., Madison, 31.088 mi. Brule Co. $35,702—to Minnehaha County, Sioux Falls, 20.678 mi. Minnehaha Co., $21,678—to Western Bridge Constr. Co., 3867 Leavenworth St., Omaha, Neb., 12.857 mi. Clay Co. $24,611—to Day County, Webster, 15.354 mi. Day Co. $7,496; 6.046 mi. Day Co. $3,416—to T. E. Sheehan Constr. Co., Sioux Falls, 14.469 mi. Faulk Co. $16,654—to H. Pickus Constr. Co., Aberdeen, 23.665 mi. Brown Co. $32,772; 21.123 mi. Minnehaha Co. $24,876—to Van & Van, Hull, Ia., 12.502 mi. Bon Homme Co. $11,275—to S. S. Roberts, Flandreau, 19.656 mi. Brookings and Moody Counties $19,249 — to M. Joyce, Brandon, 13.648 mi. Hand Co. $15,161—to Northwestern Eng. Co., Rapid City, 4.933 mi. Jackson Co. $7,329—to Lindekugel & Golberg, Spencer, 18.363 mi. Davison and Sanborn Counties $26,074—to W. E. Bartholow & Son, Spencer, 15.617 mi. McCook Co. $10,251—to J. L. Manley, Manchester, 19.032 mi. Grant and Deuel Counties $9,195—to Chaulk & Birdsall, Chadron, Neb., 1.734 mi. Lawrence Co. $9,406. Grand total $550,732. Noted June 16.

Tennessee—State Dpt. Hys. & P. Wks., Nashville, asphalt on concrete surfacing 10.729 mi. road in Giles Co., to Roberts Paving Co., Salisbury, Md., $225,732—concrete surfacing 4.668 mi. Federal Aid Project 241-A, and 8.6 mi. Sect. B, Obion Co., to Lawrence Constr. Co., Jackson, Miss., $79,982 and $142,933 respectively — 9.929 mi. Washington Co., to Murray Constr. Co., Knoxville, $237,239 — grading, drainage structures 2.82 mi. Blount and Knox Counties, to Lee A. Gridley Constr. Co., 219 Daylight Bldg., Knoxville, $95,466—4.382 mi. Roane Co., to Johnson & Mathews, Rockwood, $45,750. Grand total $827,102. Noted June 19.

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Texas—G. Gilchrist, state hy. engr., Austin, grading, drainage structures on 7.445 mi. Victoria Co., to C. T. Ingram, Box 262, Cuero, $38,763 est. $44,000—8.877 mi. Cass Co., to E. G. Powell, Jacksonville, $85,372 est. $80,000—7.756 mi. San Jacinto Co., to F. P. Jones, c/o G. E. Powell, Jacksonville, $69,884 est. $96,000—12.953 mi. Brown Co., to R. W. Briggs & Co., Pharr, $244,873 est. $280,000, both 18 ft.—6.057 mi. Tarrant Co., 20 ft. to Philpot Constr. Co., Houston, $228,796 est. $340,000—crusher run limestone on shale base or double bituminous on limestone gravel surfacing 9.773 mi. Trinity Co., to J. C. Kelley, Trinity, $96,777 est. $156,000—single bituminous surface treating 14.292 mi. Hudspeth Co., to Haden & Austin, 328 Post Dispatch Bldg., Houston, $24,854 est. $25,000—2 course limestone rock asphalt on caliche gravel surfacing 43.768 mi. La Salle Co., to Trinity Farm Gravel Co., Box 1116, Dallas, $506,410 est. $640,000, all foregoing 18 ft. Grand total $1,671,044. Noted June 19.

Texas—G. Gilchrist, state hy. engr., Austin, grading, drainage structures on 7.174 mi. Henderson and Anderson Counties, to Lucas & Lucas, Cushing, $126,802 est. $156,000—3.806 mi. Freestone Co., to Hannah Constr. Co., Box 994, Waco, $21,520 est. $26,000—2.137 mi. Tyler Co., to F. P. Jones, Jacksonville, $83,028 est. $84,000—7.536 mi. Austin Co., to H. W. Heldenfels, Rockport, $52,301 est. $56,000, all foregoing 26 ft. wide—2 course limestone rock asphalt on 10½ in. compacted caliche base course paving 9.785 mi. San Patricio Co., to Cage Bros., Bishop, $137,643 est. $180,000—2½ in. bituminous on 8 in. compacted sledged stone base course paving 13.586 mi. Throckmorton Co., to Trinity Farm Gravel Co., Box 1116, Dallas, $160,503 est. $200,000—concrete paving 9.639 mi. Baylor Co. also 6.96 mi. Hy. 24, Archer Co., and 5.041 mi. same hy. Young Co., (combined bid), to Westark Constr. Co., McAllister, Okla., $202,679 and $237,921 respectively est. $225,000 and $296,000 respectively, all 18 ft. wide—constructing steel, rein.-con. bridges on Hy. 106, Tyler Co., to W. W. Vann & Co., Mercedes, $22,092 est. $25,000. Grand total $1,044,489.

Tex., Amarillo—For 6 in. limestone paving, to Gober & Thompson, Amarillo, $40,162.

Tex., Beaumont—City, c/o R. Edmonds, secy., 1 in. Duraco on 6 in. rein.-con. paving 21,500 sq.yd., to Uvalde Rock Asphalt Co., Beaumont, $82,017.

Tex., Waco—For 6 in. rein.-con. paving 17,960 sq.yd. North 18th St., to Central Bitulithic Co., 1015 Praetorian Bldg., Dallas, $46,200. Est. $50,000. Noted June 12.

Utah—Carbon Co. Comn., Price, rock asphalt paving 4.7 mi. Spring Canyon Rd., to C. S. Harris, Price, $44,500.

Utah — State Rd., Comn., Salt Lake City, grading, graveling 17.549 mi. Filmore-Holden and Levan-Chicken Creek Rds., Juab and Millard Counties, to J. M. Sumsion, Springville, $20,156. Est. $26,606.

Wash., Seattle — Comrs. King Co., grading, straightening, concrete paving 48,660 sq.yd. Woodinville-Duvall Hy., to Erickson Paving Co., Henry Bldg., Seattle, $95,997. Noted June 5.

Wis., Milwaukee—Dpt. P. Wks., D. McKeith, comr., paving alley between North Water St. and North Bway., also North Hawley Rd., to White Constr. Co., 68 East Wisconsin Ave., $701 and $19,251 respectively—alley between North 24th St. and North 24th Pl., to Parkinson Constr. Co., 3515 Highland Ave., $17,813—East Oklahoma Ave., to N. Harris, 244 Mason St., $1,091—North 31st St. and South Clement Ave., to Czerwinski Constr. Co., 816 Clinton St., $7,954 and $24,707 respectively — South Muskego Ave., to Schwerm Bros., 1703 Weil St., $8,593—West Reservoir Ave., to W. F. Hunt, 441 Bway., $30,991. Grand total $111,101.

Wyo., Green River—City Council, curbing, guttering, paving streets in Impvt. Dist. 1, to Woodward Constr. Co., Rock Springs, $49,963.

Ont., Sault Ste. Marie—Concrete paving, to A. R. Wood, 102 Queen St. E., $40,000.

Ont., Hanover—J. Taylor, clk., concrete paving, sewers in Proctor St., to Brennan Constr. Co., 400 Gage Ave. N., $38,547. Noted June 19.

EXCAVATION, DRAINAGE, IRRIGATION, LEVEES, RIVER AND HARBOR

PROPOSED WORK

Ariz., Randolph—Randolph Irrigation Dist. preliminary plans sinking 34 wells equipped with electric pumps and concrete lined canal to irrigate 9,500 acres. $400,000. D. Scott, Phoenix, engr.

Colo., Colorado Springs — Soon takes new bids repairing Lake 4, on Pikes Peak, also drainage ditch excav. $30,000. Former bids rejected. W. C. Ray, city engr.

La., Bossier City—Bd. Comrs. Gravity Drainage Dist., Bossier Parish, soon takes new bids constructing remaining ditches in Gravity Sub-Drainage Dist. 1. $28,000. Former bids rejected. Noted June 26.

Tex., Mercedes—American Rio Grande Land & Irrigation Co., Elsa or Mercedes, concrete irrigation system on 10,000 acre tract. $500,000.

Tex., Mission—Hidalgo Co. Water Control & Impvt. Dist. 11, c/o L. M. Bentsen, McAllen Rd., purchasing water right and physical properties, incl. right-of-way, canals, concrete pipe lines, laterals, gates, bulkheads, bridges, headgates, syphons, flumes, pump house, electric borrow pit, pumps and all other facilities, owned by Mission Development within boundaries Dist. 11, also constructing concrete lined canals, pipe lines, reservoirs, syphons, meters, bridges, other appurtenances. $90,000 bonds voted.

Tex., Rio Hondo—Al. & Lloyd Parker, Inc., Olmito, irrigating tract at Monte Grande, near here, incl. construction 4 mi. dam, 14 ft. high, 8 ft. wide at top and 64 ft. wide at bottom, with reservoir 5,107 acre ft. storage capacity. Private plans.

Tex., Brownsville — Cameron Co. Water Impvt. Dist. 17, c/o D. Porter, Brownsville, preliminary plans irrigating 1,800 acre tract land, near here. $140,000. Address Owners.

N. S., Halifax—Halifax Harbor Com., improving harbor. $954,178.

BIDS ASKED

New Jersey—July 18, at office Bd. Commerce & Navigation, State House, V. Gelineau, dir. and ch. engr., dredging basin and channel in Waretown Creek, and extending into Barnegat Bay, Ocean Twp., Contr. 46-A; channel in Oyster Creek and Barnegat Bay, Ocean and Lacey Twps., Contr. 46; 1,475 ft. channel and constructing 300 ft. jetty, Union Twp., Contr. 45, all Ocean Co.

Tenn., Memphis—July 16, by Memphis Harbor Comn., at office K. Markwell Associates, engrs., 1327 Columbian Mutual Tower, stabilization of river bluffs between Talbot Ave. and Pennsylvania St., incl. 175,000 cu.yd. excav., 60,000 sq.yd. sodding, 5,000 ft. drain pipe. $150,000.

British Columbia—July 17, by N. Desjardins, secy. Dpt. P. Wks., Ottawa, Ont., dredging Fraser River, North Arm. $28,000.

Ontario—July 16, by Dpt. P. Wks., N. Desjardins, secy., Ottawa, repairing breakwater at Port Elgin, Bruce Co., $15,000; constructing wharf at Waubaushene Co., Simcoe Co., $11,000.

CONTRACTS AWARDED

Fla., Miami Beach—Ocean Beach Heights, Inc., 8,000 ft. seawall, bulkheading and concrete, to Shoreline Builders, Liggett Bldg., Jacksonville. Est. $125,000. Noted Feb. 6.

Illinois—Bd. Comrs. Fountain Creek D. D. 1, Iroquois and Vermilion Counties, at Court House, Watseka, Iroquois Co., 28,468 ft. main ditch, incl. 59,473 cu.yd. excav., and Reutter Branch, incl. 68,157 cu.yd. excav., to E. O. Sternberg, Cissna Park, at $0.1025 per cu.yd. Noted June 5.

Mass., Boston—City, Dpt. P. Wks., dredging at refuse receiving station, Fort Hill Wharf, city proper, also at Fort Hill Wharf, to Bay State Dredging & Contg. Co., 62 Condor St., East Boston, $3.10 per cu.yd. Noted June 26.

Michigan—See "Unclassified."

N. Y., New York—M. Cosgrove, comr. Docks, Pier "A," Battery Pl., dredging Harlem River, Fordham Rd., to H. Dubois Sons Co., 17 State St., $6,900. Noted July 3.

B. C., Victoria—N. Desjardins, secy. Dpt. P. Wks., Ottawa, Ont., dredging harbor, to North Western Dredging Co. Ltd., Victoria, $105,973. Noted June 5.

Ont., Collingwood—N. Desjardins, secy. Dpt. P. Wks., Ottawa, 2 mooring cribs, to William Berminham & Sons, $35,727. Noted May 29.

Que., Rimouski—N. Desjardins, secy. Dpt. P. Wks., Ottawa, Ont., dredging, to Foundation Maritimes, $44,000.

Quebec—Dpt. Marine, Ottawa, Ont., deepeping St. Lawrence River Ship Channel between Montreal and Quebec, to General Dredging Constr. Ltd., 637 Common St. W., Montreal, $131,199.

Public Bond Elections

Coming Bond Elections

Waterworks—Cassville, Mo., July 15, $32,000.
Waterworks—Lamar, Mo., July 29, $20,000.
Pumping Plant, etc.—Los Angeles, Calif., Chatsworth Water Dist., $65,000.
School—Akron, O., $750,000.

Bonds Voted

Waterworks—Mannsville, N. Y., $30,000.
Sewerage System—Westville, Okla., $40,000.
School—Manchester, N. Y., Union Free School Dist., $180,000.
School—Fargo, N. D., $150,000.

Bonds Defeated

Gymnasium—Champaign, Ill., $200,000.
School—St. Louis Park, Minn., $250,000.
School — Price, Utah, Carbon School Bd., $233,000.

FEDERAL GOVERNMENT

PROPOSED WORK

Ariz., Phoenix—SCHOOL—U. S. Vocational Indian School, c/o Superintendent, soon takes bids academic building, infirmary, nurses home, economics building, hospital.

Calif., San Francisco—MAUSOLEUM—Con. Q. M., Fort Mason, San Francisco, sketches 400 ft. square mausoleum, 200,000 crypts, crematory, chapel, at National Cemetery.

Federal Government (Continued)

Me., Togus — HOSPITAL — National Home for Disabled Volunteer Soldiers, c/o H. S. Coombs, archt., 11 Lisbon St., Lewiston, hospital.

Md., Baltimore—DREDGING—U. S. Eng. Office, 1,174,341 sq.yd. Baltimore Harbor and Channels.

Mississippi—DREDGING—U. S. Eng. Office, Mobile, Ala., 1,500,000 cu.yd. in Pascagoula Harbor.

O., Toledo—RIP RAP—Superintendent Lighthouses, Buffalo, N. Y., placing stone rip rap at Toledo Harbor Lighthouse.

Ore., Portland—FEDERAL—Treas. Dpt. at office Sup. Archt., plans by M. H. Whitehouse & Associates, Railway Exch. Bldg., federal building, post office, court and general offices.

Pa., Pittsburgh—REPAIRING—U. S. Eng., emergency repairs for leak in River Wall, Lock 36.

Tex., Waco—HOSPITAL—Vet. Bu., plans U. S. Veterans' Hospital.

Va., Norfolk—DREDGING—U. S. Eng., 1,425,382 cu.yd. James River.

BIDS ASKED

Ala., Union Springs—POST OFFICE—July 28, by Treas. Dpt., at office Sup. Archt., part 2 story, basement, post office; adv. E. N.-R. July 10.

California—BRIDGES—July 15, by Dpt. Interior, constructing Lodgepole, Clover Creek, and Silliman Creek Bridges, approaches between Stations 223-50 and E 270-67, Sects. C2 and D1, General's Hy., Route 1, Sequoia Natl. Park, Tulare Co.

California—ROADS—July 17, by Dpt. Agriculture, Pub. Rds., San Francisco, grading Sect. A, Route 21, Deer Creek Natl. Forest Hy., Lassen Natl. Forest, Tehama Co.

California — ROAD — July 22, by C. H. Sweetser, dist. engr., grading, oil processing 15.5 mi. Route 72, Idyllwild Natl. Park Forest Hy., Riverside Co.

Calif., Stockton—DREDGING—Aug. 26, by U. S. Eng., Sacramento, 2,616,400 cu.yd. in connection with Stockton Deep Water Project in San Joaquin River, and constructing levees or embankments with dragline excavator along San Joaquin River, 863,600 cu.yd. excav. Noted June 12.

D. C., Wash.—FENDERS—July 30, at office Executive Officer Arlington Memorial Bridge Comn., Navy Bldg., constructing fenders for bascule draw span of Arlington Memorial Bridge; adv. E. N.-R. July 10.

D. C., Wash.—GASOLINE—July 14, by A. L. Flint, genl. purch officer Panama Canal, bulk motor-grade gasoline, Schedule 2570.

D. C., Wash.—SMELTING PLANT—July 16, by Yards & Docks, Navy Dpt., 1 story, steel smelting plant, steel crane runway, concrete tunnel.

Idaho — ROADS — July 17, by Pub. Rds., Ogden, Utah, grading 3.78 mi. North-South Hy., grading Project 15-C, St. Joe Natl. Forest, Latah Co.; 5.7 mi. Enaville-Murray Natl. Forest Rd., Shoshone Co.; 5.56 mi. National Forest Hy., called Clarks Fork Hy., Bonner Co. B. J. Finch, dist. engr.

Ill., Chicago—HEATING—July 17, by Treas. Dpt., at office Sup. Archt., repairing heating, incl. 5 Hawley down draft furnaces, high pressure system boilers.

Ill., Sterling—HOTWATER BOILER—Aug. 1, by Treas. Dpt. at office Sup. Archt., hot water boiler, new stack.

Md., Baltimore—POST OFFICE, etc.—July 17, by 4th Asst. Postmaster General, 1 story, basement post office, garage, repair shop, 439-57 East Preston St.

Mass., Lowell—POST OFFICE—July 18, by Treas. Dpt. at office Sup. Archt., supplemental bids from original bidders U. S. Post Office. Noted Apr. 24.

Missouri—LEVEE—July 23, by U. S. Engineers, 428 Custom House, St. Louis, repairing 26,000 cu.yd. earthwork in Ste. Genevieve Levee Dist. 1, Ste. Genevieve Co.

N. Y., Elmira—ELEVATOR HATCHWAY—July 31, by Treas. Dpt. at office Sup. Archt., changes in elevator hatchway, in connection with extending and remodeling U. S. Post Office and Court House; adv. E. N.-R. July 10.

O., Wright Field—RESERVOIR—July 21, by Con. Q.M., Wright Field, Dayton, rein.-con., water storage reservoir, water pipe lines to buildings and officers quarters.

Pa., Pittsburgh—DERRICK BOAT—July 28, by U. S. Eng., furnishing, delivering afloat one steel hull, 15 ton whirler derrick boat. Noted May 1.

Tenn., Clarksville—REMODELING—July 30, by Treas. Dpt., at office Sup. Archt., remodeling, enlarging U. S. Post Office; adv. E. N.-R. July 10.

Tex., El Paso—HEATING—July 23, by Treas. Dpt. at office Sup. Archt., heating custom house.

Tex., El Paso—PLUMBING—July 21, by Treas. Dpt. at office Sup. Archt., plumbing in custom house.

Tenn., Memphis—ROADS—July 22, by U. S. Eng., bridges, culverts, and roads in connection with Bird's Point-New Madrid Floodway Drainage System. Noted June 19.

Tex., Randolph Field—HANGARS—July 28, by Con. Q.M., eighteen 1 story, steel, stone, concrete hangars. $990,000. Noted July 3.

CONTRACTS AWARDED

Ariz., Grand Canyon—HOSPITAL—U. S. Natl. Parks Dpt., c/o superintendent Grand Canyon Natl. Park, emergency hospital, to G. C. Walters, Flagstaff, $21,166.

Calif., San Diego—MAINS, etc.—Specs. 6201 and 6189—Yards & Docks, c.i. mains at Naval Operating Base, to G. W. Cushing, 2002 Market St., $2,189 (120 days); improving electric system, to Moore Electric Co., 321 West 3rd St., Los Angeles, $9,986 (120 days).

Calif., San Diego—SAND BLAST ROOMS—Spec. 6095—Yards & Docks, Navy Dpt., sand blast rooms and equipment, to Panghorn Corp., Hagerstown, Md., $31,995 (210 days).

Calif., San Francisco—WATER SOFTENER PLANT—Con. Q.M., Fort Mason, water softener plant for Letterman General Hospital, San Francisco Presidio, to F. W. Snook, 595 Clay St., $3,180.

Colo., Sterling — POST OFFICE and COURT HOUSE—Treas. Dpt. at office Sup. Archt., post office and court house, to Mead & Mount Constr. Co., Denver, $187,877. Noted May 15.

Colo., Fort Lyon — SEWAGE DISPOSAL PLANT — Vet. Bur., sewage disposal plant for U. S. Vet. Hospital, to Stearns Rogers Co., 1720 California St., Denver, $18,250. Noted May 29.

D. C., Wash.—ADDITIONS—Bureau Standards, altering and top addition, to H. Herfurth, District Natl. Bank Bldg., $73,850.

D. C., Wash.—ELEVATORS—Treas. Dpt. at office Sup. Archt., elevators for extensible building, Dpt. Agriculture, to Gurney Elevator Co., 109 West 64th St., New York, $156,975. Noted Mar. 13.

D. C., Wash.—EXTENSIBLE BUILDING—Treas. Dpt. at office Sup. Archt., extensible building for Dpt. Agriculture, to Nelson-Pedley Co., Inc., 1512 Chestnut St., Phila., Pa., $2,074,000. Noted Mar. 13.

Ind., East Chicago—POST OFFICE—Treas. Dpt. at office Sup. Archt., supplemental bids U. S. Post Office, to Coath & Gross, 549 West Randolph St., Chicago, Ill., $123,650. Noted May 8.

Ky., Lexington — COAL BUNKER and STOKER — Vet. Bu., coal bunker and mechanical stoker at U. S. Veteran's Hospital, to W. C. Spratt, Fredericksburg, Va., $19,000. Noted May 22.

La., New Orleans—HOSPITAL—Treas. Dpt. at office Sup. Archt., U. S. Marine Hospital, to R. P. Farnsworth & Co., Maritime Bldg., $1,178,000. Noted May 22.

Mass., Boston—FOUNDATIONS—Treas. Dpt. at office Sup. Archt., foundations for U. S. Post Office, Court House, to Merritt, Chapman & Scott, 17 Battery Pl., New York, $339,700. Noted June 12.

Mass., Boston—ISOLATION WARD—Treas. Dpt. at office Sup. Archt., altering U. S. Marine Hospital, to A. DeSimone, 239 Bway., Arlington, $19,000. Noted May 22.

Mass., North Adams—POST OFFICE—Treas. Dpt. at office Sup. Archt., post office repairs, to Porter & Hadfield Co., North Adams.

Mass., Worcester—POST OFFICE—Treas. Dpt. at office Sup. Archt., 6 story post office, to Murch Bros. Constr. Co., Railway Exch. Bldg., St. Louis, Mo., $670,000; elevators, to Otis Elevator Co., 813 13th St. N.W., $37,747. Noted June 19.

Minn., St. Cloud—REFRIGERATING PLANT—Vet. Bu., refrigerating plant at U. S. Veteran's Hospital, to Atlantic Ice Machine Co., 36th and K Sts., Omaha, Neb., $6,185.

Mont., Havre—POST OFFICE—Treas. Dpt. at office Sup. Archt., U. S. Post Office, to W. D. Lovell, 1415 8th St. S.E., Minneapolis, Minn., $145,900. Noted May 15.

N. M., Fort Bayard — MILK HOUSE REFRIGERATING PLANT — Vet. Bu., milk house refrigerating plant, to C. Biggerstaff, 1606 Bassett Ave., El Paso, Tex., $4,920. Noted June 12.

N. H., Hanover—POST OFFICE—Treas. Dpt. at office Sup. Archt., U. S. Post Office, to W. H. Trumbull, Hanover, $61,675. Noted May 29.

N. J., Bridgeton—REMODELING—Treas. Dpt. at office Sup. Archt., remodeling, enlarging U. S. Post Office, to Schaefer & Co., 1600 Arch St., Phila., Pa., $21,375. Noted May 29.

N. J., Lakehurst—MOORING MAST—Spec. 6196—Yards & Docks, Navy Dpt., steel mooring mast at Naval Air Station, to McKay & Kirtland, 23 West Mount Royal Ave., Baltimore, Md., $13,498 (180 days). Noted June 19.

N. J., Passaic—DREDGING—U. S. Eng., 39 Whitehall St., New York, 911,000 cu.yd. in Passaic River, to P. Sanford Ross, 277 Washington St., Jersey City, $293,342. Noted May 22.

N. Y., Madison—STORE HOUSE—Con. Q.M., storehouse, to E. Glass & Son, Clayton, $6,533. Noted Apr. 24.

N. Y., New York—ELEVATORS—Bd. Educ., 500 Park Ave., passenger elevators in Textile High School, to Otis Elevator Co., 11th Ave. and 26th St., $72,160; electric platform hoist, to C. E. Doudall, Inc., $1,610. Noted Apr. 24.

N. Y., New York—FLOOR REPAIRS—Treas. Dpt. at office Sup. Archt., post office floor repairs, to Builders Wood Flooring Co., 2286 Amsterdam Ave., $16,450.

O., Warren—REMODELING—Treas. Dpt. at office Sup. Archt., remodeling, enlarging U. S. Post Office, to E. E. Garber, Bethlehem, Pa., $8,190. Noted June 26.

Okla., Muskogee—UTILITIES BUILDINGS—Vet. Bu., utilities buildings at U. S. Veterans' Hospital, to E. C. Ross & Son, 711 East 16th St., Oklahoma City, $150,400; chimney, to Singer-Kennedy Co., 39 West Adams St., Chicago, Ill., $4,890. Noted May 8.

Oregon — ROAD — W. L. Lynch, dist. engr., Post Office Bldg., Portland, grading 5.2 mi. Hepner Hy., U. S. National Forest, Wheeler Co., to F. C. Dillard, Medford, $61,970.

Pa., Phila.—BRIDGE CRANE—Spec. 6167—Yards & Docks, Navy Dpt., on 10 ton bridge crane, Navy Dpt., to Shepard Niles-Crane & Hoist Corp., Mifflin St., Phila., $15,450. (90 days). Noted June 4.

R. I., Block Island—DREDGING—U. S. Engineer, dredging 22,360 cu.yd. Block Island Harbor, to Trimount Dredging Co., 10 State St., Boston, Mass., at $0.47 per cu.yd. Noted May 22.

Tex., Fort Sam Houston (mail San Antonio) —HEATING—Con. Q.M., 11 warm air heating system units for buildings at Army Post, to A. H. Shafer, 829 North St. Marys St., San Antonio, $28,000. Noted June 19.

Tex., Randolph Field—DRAINAGE—Con. Q.M., constructing and completing water and sewerage systems, to Colglazier & Hoff, Inc., 125 Crosby St., San Antonio, $4,283. Noted June 26.

Virginia—DREDGING—U. S. Eng., Norfolk, intercoastal waterway, to Arundel Corp., 2 Pratt St., Baltimore, Md., $199,642.

Va., Buena Vista — POST OFFICE — Treas. Dpt., at office Sup. Archt., U. S. Post Office, to Jones Bros. & Co., Wilson, N. C., $49,872. Noted May 22.

Va., Fort Myer—STABLES—Con. Q.M., service detachment stable, to Bahen & Wright, 916 Rhode Island Ave., Wash., D. C., $13,700. Noted May 29.

Va., Quantico—RESERVOIR, etc.—Specs. 6157, 6169, 6214—Yards & Docks, Navy Dpt., concrete reservoir and bachelors officer's quarters at Marine Barracks, to A. J. Saville, Inc., Electric Bldg., Richmond, $42,344 (150 days) and $24,198 (120 days) respectively; altering Barracks A, B and C, to Mechanical Eng. & Constr. Corp., 519 Mills Bldg., Wash., D. C., $17,433 (90 days). Grand total $83,975. Noted June 19.

Wash., Walla Walla—GARAGE—Vet. Bu., garage at U. S. Vet. Hospital, to E. K. Nelson, 557 Market St., San Francisco, Calif., $18,200. Noted May 29.

GRADE CROSSINGS

PROPOSED WORK

New York—Delaware & Hudson R.R. Co., J. MacMartin, ch. engr., Albany, eliminating grade crossing at Warren St., Sandy Hill-Glens Falls Co. Hy., Queensbury, Warren Co., $114,838; constructing grade crossing over tracks and adjoining trestles, for eliminating Coopersville Station Crossing, Chazy-Rouses Point State Hy., Champlain, Clinton Co., $42,500; constructing temporary detour tracks and changing existing track and signal system, $19,210.

BIDS ASKED

N. Y., Mount Vernon—July 23, at office Westchester Co. Park Comn., 72 West Pondfield Rd., Bronxville, stone, rein.-con. undercrossing at Gramatan Ave., Cross County Parkway, J. Downer, ch. engr.; adv. E. N.-R. July 10.

CONTRACTS AWARDED

California—State Hy. Dpt., Sacramento, one 112 ft., one 66 ft. and one 54 ft. deck plate girder span on concrete piers, and 279 lin.ft. timber trestle approach on framed bents and rubble masonry abutments over Southern Pacific R.R. near Yuba Pass, Nevada Co., to Bodenhamer Constr. Co., San Diego, $55,752—2 concrete abutments with wing walls under Southern Pacific R.R., near Emigrant Gap, Placer Co., also grading, untreated crushed gravel or stone on crusher run surfacing roadway, to Lord & Bishop, Sacramento, $57,816—2 rein.-con. abutments, ballasted sub-floor, near Cottonwood, Tehama and Shasta Counties, also grading, concrete paving 0.9 mi. roadway, to C. W. Wood, 47 North Grant St., Stockton, $135,058. Grand total $248,626. Noted June 5.

Ky., Louisville—Kentucky & Indiana Terminal R.R. Co., 2910 High St., W. S. Campbell, ch. engr., elevating 1 mi. double track railroad underpasses for 1 alley and 4 streets, 4 steel bridges spanning 60 ft. streets, 1 steel bridge over 120 ft. street, earth embankment between concrete retaining wall, to H. Bickel Co., 435 Garden St., $271,000. Est. $700,000. Noted May 22.

DAMS

PROPOSED WORK

Tex., Rio Hondo—See "Excavation, Drainage, Irrigation, Levees, River and Harbor."

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PIERS AND WHARVES

PROPOSED WORK

N. J., Spring Lake—PIER—Spring Lake Rod & Gun Club, C. Heilner, pres., timber, concrete extension to present pier, at south end boardwalk. $25,000. Noted Mar. 13.

CONTRACTS AWARDED

Calif., Huntington Beach—PIER—City Council, 500 ft. rein.-con. pier extension, 25 ft. wide, to Merritt-Chapman & Scott Corp., 720 Wilmington Ave., San Pedro, $110,991. Noted May 29.

B. C., Vancouver—FISH WHARF—Vancouver Wharf Comn., Dunlevey Ave., timber wharf, market stall, ice house and store building, to Northern Constr. Co., and J. W. Stewart, 736 Granville St., $220,000.

N. S., Barrington Passage—ICE PIERS—N. Desjardins, secy. Dpt. P. Wks., Ottawa, Ont., ice piers, to M. A. Nickerson & R. Irwin, Halifax, $18,850. Noted June 5.

N. S., Halifax—PIER—Harbor Comrs., pier, to Standard Constr. Co., Halifax, $500,000.

AIRPORTS

BIDS ASKED

La., Baton Rouge—July 21, by East Baton Rouge Police Jury Parish, 2 story administration building, incl. office, weather bureau, pilot lounge, waiting room, 2 story, 100 x 120 ft., brick, steel hangar. Former bids rejected. Jones, Roessle, Olschner & Weiner, Raymond Bldg., archts. Contract for wiring, awarded to Baton Rouge Electric & Machine Wks., 523 3rd St., $10,744. Noted Feb. 27.

CONTRACTS AWARDED

Mo., Bridgeton—Bd. P. Serv. general contract 1 story, 100 x 160 ft., concrete steel hangar, with lean-to for Natl. Guard, to Dunham Constr. Co., Chemical Bldg., $63,404; plumbing, to Reithwelm-Gartland Plumbing Co., 1053 Big Bend Rd., $5,143; electrical work, to Sunlight Electric Co., 2735 North Union Blvd., $4,975. Grand total $73,522. Noted June 5.

O., Cleveland—City, laying 4 in. french drain tile at Cleveland Airport, to A. Joseph, 2962 West 14th St., $52,197. Noted May 30.

GRAIN ELEVATORS

PROPOSED WORK

Neb., Gibson — GRAIN ELEVATOR — Nebraska-Iowa Grain Co., 421 Grain Exch. rebuilding grain elevator, rein.-con., steel, at Chicago, Burlington & Quincy R.R., recently burned. $400,000. Burrell Eng. & Constr. Co., 1 North Canal St., Chicago, Ill., engrs. and archts.

BIDS ASKED

N. D., Max—GRAIN ELEVATOR—See "Contracts Awarded."

CONTRACTS AWARDED

N. D., Max—GRAIN ELEVATOR—Farmers Union Terminal Assn., M. W. Thatcher, mgr., Minnesota Bldg., St. Paul, Minn., 500,000 bu. grain elevator, rein.-con., day labor. $50,000. Private plans.

Man., Fort Churchill—GRAIN ELEVATOR—Dpt. Rys. & Canals, Parliament Bldgs., Ottawa, Ont., 2,500,000 bu. grain elevator, to Carter-Halls Aldinger, Winnipeg, about $2,000,000. Noted June 12.

Ont., Fort William—GRAIN STORAGE ANNEX—N. M. Patterson & Co., 1,600,000 bu. grain storage annex, to Fegles Constr. Co., 523 South 7th St., Minneapolis, Minn. and Fort William. Est. $250,000.

POWER AND LIGHTING

CONTRACTS AWARDED

Mich., Detroit—D. C. Grobel, acting secy. Bd. Water Comrs., electric conduit and lighting systems for Springwells Station, Contr. GC2, to Iron City Eng. Co., 1240 Michigan Theatre Bldg., $137,790.

N. Y., Brooklyn—H. Hesterberg, pres. Brooklyn Boro, Boro Hall, electrical work for Brooklyn Central Court House, to Martin Epstein Co., 118-35 Metropolitan Ave., $136,000. Noted May 29.

SPORTS AND PARKS

PROPOSED WORK

Fla., Miami Beach—Roney Plaza Hotel, N. B. T. Roney, sketches by R. A. Taylor, Spanish Village, swimming pool and other buildings, Collins Ave. and 23rd St.

Fla., Miami Beach—See "Clubs."

Mass., Belmont—Belmont Hill School, 350 Prospect St., sketches by Little & Russell, 20 Newbury St., Boston, altering and constructing 1 story, brick field house addition, Prospect St. $25,000 or more.

Mo., Kansas City—Pla-Mor Co., 200-30 Main St., swimming pool. $100,000.

N. J., Hackensack—Hackensack Natatorium Club, 130 Main St., plans 70 x 100 ft., rein.-con., tile swimming pool, grading, constructing miniature golf course, tennis courts. $70,000. Noted June 12.

N. J., Linden—Bd. City Council, City Hall, concrete, tile swimming pool. $25,000. Engineer not selected.

N. J., Nutley—Harrison Park Impvt. Co., 24 Branford Pl., Newark, amusement park, incl. grading, landscaping, 2 swimming pools, bath houses. $150,000. M. A. Wolf, 845 Broad St., Newark, archt.

N. Y., Brooklyn—BATHS—City, Superintendent P. Baths, Municipal Bldg., New York, public baths, Montrose and Union Aves. $100,000.

N. Y., Gouverneur — Gouverneur Country Club, golf course. S. Sherman, Utica, engr.

N. Y., Lake Placid—See "Clubs."

Tex., Corpus Christi — Crystal Beach Park, c/o W. Petier & F. Thomas, amusement park, incl. installation roller coaster, $125,000. Total est. $1,000,000. Private plans.

Ont., London—D. Bright, engr., 119 King St., soon takes bids bath house, incl. filters, electric pumps, storage tanks and two 110 hp. steam boilers, for Canadian Mineral Baths, 420 Talbot St. $50,000.

BIDS ASKED

Mass., Belmont—See "Contracts Awarded."

Mass., Boston — July 14, by Dpt. School Buildings, playground shelters at various schools. $25,000.

N. J., Newark—Essex Co. Park Comn., 115 Clifton Ave., bids about July 15, children's building and bandstand, Independence Park. Former bids rejected. Goodwillie & Moran, 56 West 45th St., New York, archts. Noted May 29.

CONTRACTS AWARDED

Calif., Pasadena—City, addition to Rose Bowl Stadium, to W. Crowell, 495 South Bway., $139,800. Est. $170,000. Noted June 26.

Mass., Belmont—Town, Bd. Selectmen, reconstructing, completing McGinnis and Edgarland Playgrounds, day labor. $50,000 or more.

Mass., Deerfield—Deerfield Academy, F. Boyden, headmaster, gymnasium, swimming pool, to J. R. Hampson & Co., Inc., 164 North St., Pittsfield. Est. $150,000. Noted Jan. 2.

Tex., Dallas—State Fair of Texas, c/o T. I. Jackson, pres., Santa Fe Bldg., rein.-con., timber stadium, in 18 ft. sunken bowel, 45,000 seating capacity, at Fair Park, to Central Contg. Co., Athletic Club Bldg. Est. $200,000. Noted Jan. 30.

HEATING AND VENTILATING

CONTRACTS AWARDED

N. J., Bayonne—Bd. Educ., J. Sklenar, secy., 651 Bway., heating system in School 8, to A. A. MacNeille, 724 Bway., $29,900.

N. Y., Ithaca—Cornell University Law School, heating Myron Taylor Hall, to Howe & Bassett, 840 University Ave., Rochester; plumbing, to Williams & Docket, Buffalo; electrical work, to Dingle-Clark Co., Engineers Bldg., Cleveland, O. Est. $25,000 or more. Noted July 3 under "Schools."

UNCLASSIFIED

PROPOSED WORK

Ariz., Flagstaff—CAMP—National Guard of Arizona, Phoenix, sketches permanent encampment, incl. warehouse, power house, infirmary, guardhouse, mess halls, at Fort Alexander M. Tuthill, $100,000. J. F. Pomeroy, adjutant genl.

Mass., Hull — WHARF BUILDINGS — Nantasket Beach Steamboat Co., F. L. Lane, genl. mgr., 7 Rowe's Wharf, Boston, wharf buildings, waiting rooms, offices. $150,000. Silsbee & Gould, 1 Court St., Boston, engrs.

Tex., Violet—TANK FARM—Houston Oil Co., Petroleum Bldg., Houston, tank farm, incl. six to ten 55,000 bbl. steel tanks. Private plans.

Ontario — MODEL TOWN — Noffke-Morni & Sylvester, archts., Medical Arts Bldg., Ottawa, preparing plans and soon take bids constructing model town on 800 acres, incl. sewers, water system, roads, electric lighting, stores, garages, houses, for Syndicate, c/o architects, Port Prescott, near Prescott. $2,000,000.

BIDS ASKED

Mass., Boston—ELECTRICAL WORK—July 7, by Dpt. School Buildings, 11 Beacon St., electrical work, apparatus in schools at Norman, Newbury and Ferdinand Sts. $25,000.

Mass., Boston—ELECTRICAL WORK—July 14, by Dpt. School Buildings, electric light wiring apparatus in various schools. Est. $25,000.

N. Y., Hempstead—TEST BORINGS—Aug. 5, by Hempstead Causeway Authority, 250 Fulton Ave., test borings, Contr. 104. H. H. Parsons, ch. engr.; adv. E. N.-R. July 10.

N. Y., New York—PILE DRIVER—July 14, by M. G. Cosgrove, cor. Docks, Pier "A," Battery Pl., constructing, furnishing new wood or steel pile driver, Contr. 1984.

Texas — PUMPING STATIONS — Phillips Petroleum Co., Bartlesville, Okla., taking bids 10 pumping stations, equipped with electric motor driven, centrifugal pumps or Diesel type engines. Noted June 12 under "Oil Pipe Lines, Contracts Awarded."

CONTRACTS AWARDED

Calif., Long Beach—TRANSIT SHED—City Council, steel, concrete, corrugated iron transit shed, to Lynch Constr. Co., 730 Merrill Ave., Los Angeles, $92,598. Noted June 5.

Calif., Oakland—TRANSIT SHED—City Port Comn., Oakland Bank Bldg., 400 ft. transit shed extension, to Schuler & McDonald, 9th Ave. Pier. $104,715. Noted June 19.

Ky., Glen Springs — FISH HATCHERY — Kentucky Game & Fish Comn., fish hatchery, incl. buildings, 18,300 cu.yd. excav., 400 cu.yd. concrete in place, 30,000 lb. reinforcing steel in place, 500 ft. 8- to 12-in. culvert pipe, 600 ft. 4 in. tile, to J. M. Perkins, Frankfort. Est. $25,000. Noted June 5.

Mass., Boston—BUS TERMINAL—Boston Worcester & New York Street Ry. Co., 210 Newbury St., 1 story, brick, steel, to B. E. Van Ness, 60 West Dedham St. Est. $50,000 or more. Noted Mar. 27.

Michigan—FERRY DOCK—State Hy. Comr., Lansing, dredging, preparing crib foundations, 13 cribs from 24 x 60 ft. to 24 x 100 ft. triangular shaped ferry dock, MB1 of 16-11-22C-7, Cheboygan Co., to Lyons Constr. Co., Grand Rapids, $192,885. Noted May 1.

Mo., Crystal City — GAS DISTRIBUTION SYSTEM—Missouri Natural Gas Co., 1017 Olive St., St. Louis, natural gas distribution system to connect with Mississippi River Fuel Co. trunk line from Louisiana fields, to Management & Eng. Corp., 327 South LaSalle St., Chicago, Ill., engrs. and contractors. $40,000.

N. Y., New York—COAL POCKET—Silver Coal Co., 1616 Webster Ave., coal pocket to Derrick Hoist & Constr. Co., 539 Hudson St. Est. $40,000. Noted June 27.

Texas and Missouri—COMPRESSOR, etc.—Missouri-Kansas Pipe Line Co., 820 Dwight St., Kansas City, Mo., 20,000 hp. compressor, and engine compressor equipment, for pipe line from Texas Panhandle to points in Missouri, to Cooper-Bessmer Corp., 200 Thomas Ave., Mt. Vernon, O., $1,000,000. Noted June 5 under "Contracts Awarded."

Que., Montreal—STEAM TUNNEL—McGill University, Sherbrook Ave. W., steam tunnel on campus, to E. G. M. Cape & Co., 620 Cathcart St., $30,000; plumbing and steam fitting, to J. Ballantyne, 236 Nazareth St.

MATERIALS

BIDS ASKED

CRUSHED ROCK—**Oroville, Calif.**—City in market 35,000 tons crushed rock. Former bids rejected.

PAVING BLOCKS — **Atlantic City, N. J.**—July 17, by Bd. City Comrs., City Hall, fifty thousand 3 x 4 x 8½ in. vitr. clay paving blocks, f.o.b. Atlantic City. $5,000. J. W. Hackney, city engr.

PORTLAND CEMENT, etc.—**Long Island City, N. Y.**—July 14, by G. U. Harvey, pres., Queens Boro, Queens Subway Bldg., 3,000 bags portland cement; 20,000 cu.yd. sand; 225,000 gal. fuel oil; 100,000 gal. gasoline; honing, shaping and crowning dirt roads.

GASOLINE, etc.—**New York, N. Y.**—July 14, by J. Miller, pres. Manhattan Boro, Municipal Bldg., 80,000 gal. gasoline; 15,000 gal. furnace oil; 3,500 yd. concrete and paving sand; 700,000 gal. asphaltic cement; 20,000 bags portland cement.

WHITE LEAD—**New York, N. Y.**—July 18, by P. J. Dooling, comr. Purchase, Municipal Bldg., white lead to Dpt. Plant & Structures.

CONTRACTS AWARDED

BRIDGE TIMBER — **Florida** — State Road Dpt., Tallahassee (**P. means Project**), to Eppinger & Russell, Buckman Bldg., Jacksonville, treated piling P. 845 $2,871, P. 846 $2,528, both in Taylor Co., P. 785, St. Johns Co. $1,017; to Woodstock Slag Co., 2201 1st Ave. N., Birmingham, Ala., 2,100 tons slag, P. 649 $5,460, 3,000 tons slag, P. 652 $7,800; to Barrett Co., Fairfield, Ala., 22,000 gal. T. C. 2, P. 649, $2,552; to Pan American Petroleum Corp., Rhodes-Haverty Bldg., Atlanta, Ga., 56,000 gal. oil asphalt S-V, P. 652 $3,108, 43,000 gal. oil asphalt S-V, P. 649 $2,387; to Roquemore Gravel Co., Montgomery, Ala., 2,000 tons pea gravel, P. 652 $2,360, 1,500 tons pea gravel, P. 649 $1,920, 1,062 tons, P. 819 $1,253, all in Okaloosa Co.; to Birmingham Slag Co., Birmingham, Ala., 1,260 tons slag, P. 733, $3,150; to Everglades Constr. Corp., Hialeah, 17,000 cu.yd. rock cap, P. 669-C, Dade Co., $11,985; to Savannah Creosote Co., Savannah, Ga., treated timber, P. 726, Dixie Co., $3,335. Grand total $51,726. Noted June 12.

ROAD OIL—**Davenport, Ia.**—Scott Co., 130,000 gal. road oil, to Carters-Waters Corp., Des Moines, at $0.0404 per gal. delivered. Noted May 8.

ASPHALT BINDER, etc.—**St. George, N. Y.**—J. A. Lynch, pres. Richmond Boro, Boro Hall, 125,000 gal. asphaltic binder, to Standard Oil Co., 26 Bway., New York, $11,875; 500 cu.yd. pea gravel, to J. Johnson, 455 Bway., West New Brighton, $1,100; 500 cu.yd. pea gravel, Dist. 3, to Van Bro Constr. Co., 24 Elizabeth St., West New Brighton, $1,115. Grand total $14,090. Noted June 19.

BROKEN STONE—**St. George, N. Y.**—J. A. Lynch, pres. Richmond Boro, Boro Hall, 1,500 cu.yd. broken stone and 500 cu.yd. pea gravel, to J. E. Donovan, 2205 Richmond Terrace, Port Richmond, $4,875 and $1,275 respectively. Noted June 19.

EQUIPMENT

BIDS ASKED

TRACTOR—Mantorville, Minn.—July 14, by G. L. Taylor, aud. Dodge Co., one 20 or 30 hp. wheel-type tractor.

GRADER—West New Brighton, N. Y.—July 16, by J. A. Lynch, pres. Richmond Boro, Boro Hall, 1 road grader with scarifier as per specifications to Dubois Ave. Storeyard, Bureau of Hys., Richmond Boro.

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FOREIGN

Bahamas, Bimini — Bimini Enterprises, Inc., Miami, Fla., T. S. Dillingham, pres., developing Bimini, incl. hotel, brewery, distilling plant, cottages, dock, general contract, to Ensley Constr. Co., Professional Bldg., Miami, Fla. Est. $500,000.

Mexico—Government, Mexico City, L. Pena, consul, Del Rio, Tex., reconstructing and expanding San Carlos Irrigation project near Villa Acuna, to White Eng. Co., c/o S. Mejorada, engr., Villa Acuna, or Del Rio, Tex. Est. 1,000,000 pesos.

New Zealand — Government, Melbourne, is endeavoring to secure the services of an outstanding Canadian engineer to effect repairs to recently completed Arapunia Power Plant.

Buildings

RESIDENTIAL

BIDS ASKED

N. J., Bloomfield—See "Contracts Awarded."

N. J., Lakewood—Lakewood Milk & Rest Cure, Inc., 154 Nassau St., New York, bids after July 15, general contract 2 story, basement, brick, steel hotel, sanitarium, $300,000. H. Ginsberg, 205 East 42nd St., New York, archts. Noted June 12.

N. M., Hot Springs — H. L. Lockhart, 511 Randolph St., El Paso, soon takes bids, hotel, $250,000. G. L. Frazier, El Paso, Tex., archt.

N. Y., Brooklyn — Shampan & Shampan, archts., 188 Montague St., taking bids separate contracts apartment, Ridge Blvd. and 93rd St., for Corporation, c/o architects. $400,000.

N. Y., Brooklyn—See "Contracts Awarded."

N. Y., New York—Caughey & Evans, archts., 29 West 34th St., bids about December, general contract 12 story, 317 East 56th St., for D. Fuller, c/o architect. To exceed $300,000.

Wis., Wauwatusa—B. Uthus, archt., 208 3rd St., Milwaukee, soon lets contract 3 story, basement, 80 x 126 ft., brick, plain found., East Milwaukee St., for Sub Realty Co., c/o architect.

CONTRACTS AWARDED

Calif., Eureka—O'Brien Bros. & D. W. Peugh, archts., 315 Montgomery St., San Francisco, 10 story, basement, rein.-con. hotel, to J. L. McLaughlin, 251 Kearny St., San Francisco, for Pickwick Co., 5th and Mission Sts., San Francisco. $500,000. Noted May 15.

Calif., Los Angeles—J. Braunstein, 7 story, 75 x 150 ft., rein.-con., to Far West Constr. Co., Pacific Natl. Bank Bldg., $168,500.

Calif., Los Angeles—Central Holding Corp., 110 North Almeda St., 13 story, basement, 99 x 200 ft., concrete, rein.-con., steel, tile marble, ornamental wrought iron, La Brea Ave. and Hollywood Blvd., to H. W. Baum Co., Central Bldg., $620,000.

Ind., Vincennes—George Rogers Clark Hotel, foundation for 8 story, basement, 85 x 120 ft., brick, steel, 4th and Main Sts., to S. L. Kirk, 311 Harrison St.; structural steel, to Vincennes Bridge Co., Vincennes. Est. $275,000.

N. J., Bloomfield—Okin & Isaacs, c/o M. A. Wolfe, archt., 845 Broad St., Newark, 5 story, basement, 110 x 115 ft., brick, steel, Broad St. and Comley Pl., separate contracts. $150,000.

N. J., New Brunswick — M. Rosta, Central Ave., general contract 3 story, basement, brick, steel, incl. stores, Central Ave. and Robinson St., to A. Toth, Alexander St. Est. $150,000.

N. Y., Brooklyn — W. M. Calder Co., 2703 Avenue V, 2 story apartment, separate contracts, $200,000. J. A. Boyle, 367 Fulton St., archt. Noted Mar 24.

N. Y., Brooklyn — Shore Road Development Co., Marine Ave. and 96th St., apartment, Shore Rd. and 92nd St., separate contracts. $175,000. B. Braunstein, 163-18 Jamaica Ave., Jamaica, archt.

N. Y., Brooklyn — Grasmoor, Inc., 2054 Nostrand Ave., 6 story 84 x 100 ft., Nostrand Ave. and Glenwood Rd., separate contracts. $175,000. J. Martine, 545 5th Ave., New York, archt.

N. Y., New York—J. A. Campbell, 50 Central Park West, 16 story, 100 x 175 ft. apartments, 422 East 86th St., to Edgar Ellinger, 16 East 52nd St., New York. Est. $500,000. Contractor now taking separate contract bids.

Okla., Oklahoma City—L. Black, Commerce Exch. Bldg., 11 story, basement, 75 x 140 ft., rein.-con., plain found., Grand and Hudson Sts., to E. V. McCright & Co., Commerce Exch. Bldg., $600,000.

CLUBS

PROPOSED WORK

Fla., Miami Beach — Sea Club, Inc., soon takes bids clubhouse, 40 x 100 ft. swimming pool, 100 cabanas, new sea wall, concrete piling, between 87th and 88th Sts., facing ocean. $150,000. F. W. Woods, Ingraham Bldg., Miami, archt. Noted Apr. 17.

Fla., Miami Beach—Indian Creek Golf Club, J. H. Middleton, secy., c/o Bath Club, soon takes bids clubhouse, swimming pool, etc., island in Bay West of 92nd St. R. A. Taylor, Spanish Village, Miami Beach, archt. Treanor & Fatio, Palm Beach, assoc. archts. Belsham, Jorgensen & Schreffler, Calumet Bldg., Miami, engrs.

Md., Baltimore — Biltmore Holding Co., C. E. Bentley, pres., Emerson Hotel, plans by F. A. Fletcher, 13 West Franklin St., 12 story, basement, concrete, steel clubhouse, 219-25 North Calvert St. $800,000.

N. J., Weehawken—W. Mahnken, archt., 401 32nd St., Union City, 3 story, basement addition, Hudson Blvd. E. and 6th Sts. for B.P.O.E., 2 6th St. $150,000. Project in abeyance. Noted June 12.

N. Y., Lake Placid—Adirondack Club of Lake Placid, club, incl. swimming pool, golf course, 200 car garage.

O., Hamilton—Y. W. C. A., 3rd and Dayton Sts., bids late in August, general contract club, Dayton St. $300,000. F. B. and A. Ware, 1170 Bway., New York, archts. C. F. Beeler, Hamilton, structural engr. A. O. Blackman, 33 West 42nd St., New York, mechanical engr. Noted Apr. 3.

BIDS ASKED

N. J., Hohokus—Owner, c/o P. J. Jossier, archt., 240 Broad Ave., Palisades Park, bids about Aug. 1, general or separate contracts 2 story, basement, 90 x 180 ft., brick, steel, plain found. $200,000.

N. J., Irvington (br. Newark)—A. M. Kleeman, archt., 987 Springfield Ave., bids about July 15, general or separate contracts 2 story, basement, 60 x 100 ft. brick, steel, plain found., 40th St., for Irvington Amateur Athletic Club, 23 Myrtle Ave. $150,000. Noted July 3.

N. J., Red Bank—J. C. and G. A. Delatush, archt., 9 Broad St., bids about July 15, general contract 2 story, basement, brick, steel, riverfront. $150,000. Noted June 12.

CONTRACTS AWARDED

Conn., New Haven—Alpha Chi Rho Fraternity, 310 York St., brick, limestone fraternity house, to National Constr. Co., 152 Temple St. Est. $275,000. Noted June 5.

HOSPITALS

PROPOSED WORK

Mass., Gloucester—Addison Brooks Hospital, c/o Phillips & Hollran, archts., 191½ Main St., revised plans altering and constructing 2 story, basement, brick addition, plain found., Washington St. $150,000. Noted Dec. 19.

Mass., Springfield—Springfield Hospital, 759 Chestnut St., revised plans by Stevens & Lee, 45 Newbury St., Boston, 7 story, basement, 60 x 200 ft., hospital addition, and 2 story, basement, 50 x 240 ft. service building, brick, limestone, steel, plain founds., North Chestnut and Springfield Sts. $1,000,000. Noted May 15.

Mass., West Boylston — Worcester Co. Hospital, sketches by Frost, Chamberlain & Edwards, 390 Main St., Worcester, tuberculosis hospital. $150,000 or more.

Mo., St. Louis—Bd. P. Serv., 208 City Hall, sketches by A. Osburg, City Hall, 6 story, basement, 99 x 244 ft., brick, rein.-con., stone, terra cotta nurses' home, incl. gymnasium, offices, Gratton and Carroll Sts. $600,000. L. R. Bowen, city engr.

Mo., St. Louis — St. Louis University, c/o A. Schwitalla, 1402 South Grand Blvd., rein.-con., brick, steel, Firmin Desloge Hospital, Grand Blvd. between Vista and Rutger Sts. $1,000,000. Study & Farrar, 1363 Arcade Bldg. and A. J. Widmer, 1217 Fullerton Bldg., asso. archts. Noted Feb. 13.

N. Y., Buffalo—Buffalo General Hospital, 100 High St., sketches by F. J. and W. A. Kidd, 524 Franklin St., 11 story addition, 100 High St. $2,000,000 funds to be raised for same.

N. Y., Yonkers—City bids early in August, clinic and health center, City Hall Park. $300,000. W. P. Katz, 45 South Bway., archt. Noted June 19.

O., Cleveland—Parkwood Hospital Assn., J. E. Tuckerman, pres., 701 Parkwood Ave., plans by George S. Rider Co., Century Bldg., 5 story, basement, 40 x 117 ft. and 40 x 70 ft., brick, steel, concrete addition, Parkwood Dr. $400,000.

BIDS ASKED

Calif., San Bernardino—I. E. Loveless, Robertson Bldg., Beverly Hills, taking bids 5 story, basement, 200 x 200 ft. hospital, 3 story, 100 x 100 ft. convent, rein.-con., for Sisters of Charity. Noted Oct. 24.

CONTRACTS AWARDED

Conn., Stamford—Visiting Nurses Assn., B. Mead, 41 Bank St., New York, 3 story nurses home, Gurnsey Ave., to Genovese & Rich, Inc., 280 Atlantic Ave. Est. exceeds $150,000.

Kan., Leavenworth—Cushing Hospital, c/o A. W. Jackson, pres., general contract 4 story, basement, rein.-con., brick, stone, to Lehr Constr. Co., St. Joseph, Mo., $119,700. Noted June 19.

Mass., Plymouth—Jordan Hospital, altering and constructing 2 and 3 story, brick contagious ward and administration building additions, plain founds., to C. D. Howland, 3 Pleasant St. Est. $150,000. Noted May 1.

W. Va., Parkersburg—St. Josephs Hospital Assn., 6 story hospital, to Plate Constr. Co., Parkersburg, $281,600.

CHURCHES

PROPOSED WORK

Conn., New Britain—Holy Cross Parish, S. Bartkowski, pastor, Glover St., 1 story, basement church, Farmington Ave. $150,000. Engineer and architect not selected.

Conn., Waterbury—West Side Hill Methodist Episcopal Church, soon lets contract 3 story, stone church, school, West Main St. $150,000. Bureau of Architects, 1701 Arch St., Phila., Pa., archts.

Kan., Kansas City — Leavenworth Diocese, 2300 North 8th St., Kansas City, Mo., plans by Brinkman & Hogan, 513 Citizens Natl. Bank Bldg., Emporia, 3 story, basement, rein.-con., brick, 18th and Bennett Sts. $200,000.

Mass., Medford (br. Boston)—St. Clement's Parish, T. F. McCarthy, 71 Warner St., Somerville, sketches by M. P. Meade, 80 Boylston St., Boston, church. $150,000 or more.

Mass., Pittsfield—St. Mark's Roman Catholic Parish, M. J. Leonard, plans by J. W. Donahue, 1200 Main St., Springfield, 1 story, basement, concrete, steel, granite, West St. $150,000 or more. Noted June 26.

BIDS ASKED

Ia., Dubuque — Sisters of Visitation, c/o Mother Superior M. Catherine, bids about July 15, 4 story, rein.-con., brick convent, Julien and Alta Vista Aves. $200,000. C. H. Johnston, 360 Robert St., St. Paul, Minn., archts. Noted Mar. 13.

N. H., Nashua — Infant Jesus Parish, A. Jannelle, pastor, taking bids brick church, parochial school. $150,000. W. E. Provost, 1061 Elm St., Manchester, archt. Noted June 5.

N. J., Irvington (br. Newark)—N. Hulme, archt., 1524 Chestnut St., Phila., Pa. bids about Aug. 15, general contract 2 story, basement, brick, steel, plain found., for Methodist Episcopal Church, R. L. Luerich, pastor, 64 Myrtle Ave. $150,000. Noted June 27.

N. J., Red Bank—N. Hulme, archt., 1524 Chestnut St., Phila., Pa., bids about July 15, general contract 2 story, basement, brick, steel, Broad and LeRoy Sts., for 1st Methodist Church of Red Bank, F. A. De Maris, pastor. $250,000. Noted June 12.

CONTRACTS AWARDED

D. C., Wash.—St. Albans Protestant Episcopal Cathedral, additional unit, to G. A. Fuller Co., Munsey Bldg., $200,000.

Ind., Indianapolis—Catholic Church Sisters of Our Lady of Mt. Carmel, general contract brick, rein.-con. monastery, on Cold Springs Rd., to Michaelis Bros., 5929 Central Ave. Est. $300,000.

Pa., Indiana — Simpson & Ralston, Inc., archts., 45 Walnut St., Newark, N. J., 2 story, basement, brick, steel, plain found., to Wilson Constr. Co., Johnstown, for First Methodist Episcopal Church. Est. $150,000. Noted June 5.

R. I., Providence—St. Teresa Parish, M. F. O'Brien, pastor, altering and constructing 1 story, basement, brick, concrete, steel addition, incl. new tower, 275 Manton Ave., to R. J. MacIntyre, 6 Fairoake Ave. Est. $150,000.

SCHOOLS

PROPOSED WORK

Calif., Monterey — Monterey Union High School Dist. plans by Swartz & Ryland, Spazier Bldg., schools, additions. $225,000 bonds voted for same.

Conn., New Haven—Yale Divinity School, Trustees Yale University, plans by Delano & Aldrich, 126 East 38th St., New York, stone divinity school and quarters for students, Sachem, Prospect and Hillhouse Aves. $2,500,000. **Maturity in 1931.**

Conn., New Haven—Yale University, trustees Yale University, plans by John Russell Pope, 542 5th Ave., New York, brick, stone dormitory group, College St. To exceed $150,000.

Conn., Stratford—Town, J. W. Wright, town mgr., plans by F. J. Dixon, State St., Bridgeport, 8 room brick steel school, South End Sect. and plans by F. C. Beckwith, 19 P. O. Arcade, Bridgeport, 4 room addition to Gardner St. School. $150,000. Noted June 12.

Ind., Bloomington—School Comrs. plans by A. Grindle, Bloomington, brick, steel, limestone grade school, 2nd St. $150,000.

Ind., Ft. Wayne—School Comrs. plans by C. Carlson, Ft. Wayne, brick, steel, school. $150,000.

Ind., Jeffersonville — Jeffersonville Bd. Trustees, high school addition, gymnasium. $155,000.

Ia., Des Moines — Drake University, W. J. Goodwin, chn., sketches rein.-con., brick, stone, 25th and University Sts.

Kan., Kansas City—Leavenworth Diocese of Roman Catholic Church, c/o E. F. Vallely, chn., 2300 North 8th St., plans by Brinkman & Hagan, 513 Citizens Bank Bldg., Emporia, 3 story, basement, rein.-con., brick, high school for boys, 18th and Barnett Sts. $200,000.

La., Rayville — Richland Parish School Bd., c/o J. A. Ball, pres., plans by E. F. Nield, City Bank Bldg., Shreveport, brick, concrete new schools and additions in Dist. 18. $225,000 bonds voted.

Md., Baltimore—University of Maryland, Lombard and Greene Sts., plans by Smith & May, Baltimore Trust Bldg., 3 story, limestone, brick, steel law building, Redwood St. between Greene and Paca Sts. $175,000.

Mass., Billerica — Town, M. A. Buck, chn. building com., Concord Ave., sketches by P. F. Gilbert, 53 Central St., Lawrence, 3 story, basement, 165 x 175 ft., brick, school, Pinehurst Dist. $180,000. Noted Apr. 10.

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Schools (Continued)

Mass., East Bridgewater—Town, H. L. Morehouse, chn. Building Com., revised plans by W. S. Holmes and Hendrick & Haywood, 192 Boylston St., Boston, 3 story, basement, brick school, plain found., Central St. $200,000. Noted Feb. 20.

Mass., Fairhaven—Town, W. B. Gardiner, chn. School Com., revised plans by W. Tallman, 222 Union St., New Bedford, altering and constructing 2 story, basement, brick, steel high school addition, plain found. $200,000. Noted Feb. 27.

Mass., Needham—Town, R. Cole, chn. Building Comn., plans by Shepard & Stearns, 65 Franklin St., Boston ,and soon takes bids altering and constructing 2 story, basement, brick addition, plain found. ,May St. $150,000.

Mass., Randolph—Town, F. Chapin, chn. School Comn., brick addition to school, Holbrook Garden Sect., and new grade school, O St. $125,000-$150,000. Engineer and architect not selected.

Mass., Waltham—City, P. Duane, mayor, City Hall, school, probably brick, stone, Prospect Hill Ave. and Prospect Hill Rd. $150,000-$200,000. Engineer and architect not selected.

Minn., St. Louis Park—Bd. Educ., E. J. Skibness, clk., defeated $250,000, for 2 and 3 story, basement school. Stebbins, Haxby & Bissell, 1111 Nicollet Ave., Minneapolis, archts.

N. J., Chatham—Fanning & Shaw, archts., 49 Ward St., Paterson, soon lets contract 2 story, basement, brick, steel, plain found., Washington Ave. and Chatham St., for St. Patricks Parochial School. $150,000.

N. J., Hillside (sta. Elizabeth)—Bd. Educ., H. W. Doremus, pres., Twp. Hall, sketches by J. Wind, Jr., 1450 North Broad St., 2 story, basement, brick, steel, rein.-con. plain found., Winans Ave. and Leslie St. $165,000. Noted Nov. 7.

N. J., Hillside (sta. Elizabeth)—Bd. Educ., H. Doremus, pres., Township Hall, sketches by J. Wind, Jr., 1450 North Broad St., Newark, 2 story, basement, Conant and Winchester Aves. $175,000. Noted Nov. 7.

N. J., Lyndhurst (br. Rutherford)—Bd. Educ., High School, sketches by Guilbert & Betelle, 20 Branford Pl., Newark, Grade and Junior High School, 2 story, basement, brick, steel, rein.-con. $500,000. Noted June 4.

N. J., Perth Amboy—Bd. Educ., 261 State St., Junior and Senior High School, 2 story, basement, brick, steel, Chamberlain, Colgate and Clinton Aves. $150,000. Engineer and architect not selected.

N. Y., Brooklyn—Bd. Educ., 500 Park Ave., New York, addition to P. S. 228, incl. printing and electric wiring shops, model commercial offices, Avenue S and West 4th St. $400,000.

N. Y., Williamson—Bd. Educ. sketches by C. W. Clark, Cortland, 2 story, 160 x 225 ft. school, cafeteria, kitchen. $375,000.

O., Alliance—Bd. Educ. plans by Fulton & Taylor, 8120 Euclid Ave., Cleveland, 2 story, basement, concrete, brick, steel grade school. $150,000.

Pa., Aliquippa—Beaver Co., election July 15, $175,000, brick, steel school, for Bd. Educ., I. C. Wright, pres., 110 Major St. Carlisle & Sharrer, Martin Bldg., Pittsburgh, archts.

Pa., Bellevue—Bd. Educ., E. H. J. Freese, chn. Building Com., 68 Jackson Ave., plans by E. Stotz, 801 Bessemer Bldg., Pittsburgh, Grant Grade School, Grand St. $150,000-$200,000.

Pa., Pittsburgh—Bd. Educ., W. H. Cramblet, secy., Admin. Bldg., sketches by T. Pringle, 706 Renshaw Bldg., and O. J. Robling, 1022 Fulton Bldg., Lincoln Place Elemeentary School, brick, steel, Frankstown Ave.

R. I., Cumberland (mail Manville)—Town, School Bd., rejected bids June 23, 3 story, basement, 80 x 115 ft., brick, stone, steel high school, plain found., Broad St. To exceed $150,000. W. S. Holmes, Lansing, Mich., archt. Noted June 19.

R. I., Newport — City, H. W. Lull, supt. schools, sketches by D. Shapiro, Globe Bldg., Fall River, Mass., Junior High School, Thayer St., $150,000 or more; 2 school additions, Mary and Cranston Sts., $150,000.

Tenn., Knoxville—University of Tennessee, H. A. Morgan, pres., sketches Alumni Memorial Gymnasium, incl. auditorium 5,000 seating capacity, large gymnasium 4,500 seating capacity, and 2 smaller gymnasiums. $250,000.

Wis., Milwaukee—Bd. School Directors, bids in fall, Steuben Junior High School, 3 and 4 story, 200 x 225 ft., brick, steel, rein.-con., plain found., North St. $150,000. G. W. Wiley, c/o School Bd., archt.

Wis., Milwaukee—Bd. School Directors, bids in fall, Girls Technical High School, 4 story, basement, 160 x 195 ft., brick, steel, rein.-con., plain found., 19th and Wells Sts. Noted Nov. 14.

Que., Montreal—Bd. Educ. plans by Nobbs & Hyde, 14 Phillips Sq., Royal Victoria College addition, Sherbrooke St. $350,000. Excavation for above, to D. Verochio Co. Ltd., Western St.

BIDS ASKED

Del., Laurel—July 21, by Delaware School Foundation, A. J. Taylor, vice pres., Du Pont Bldg., Wilmington, 2 story, basement, brick, rein.-con., steel addition, plain found. $150,000. Guilbert & Betelle, 20 Branford Pl., Newark, N. J., archts. Noted June 19.

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D. C., Wash.—July 15, by District Comrs., District Bldg., Alice Deal Junior High School.

Ill., Ashley—July 12, by Bd. Educ. Ashley Twp. High School Dist. 100, W. Foehr, pres., rein.-con., brick gymnasium. F. E. Rixmann, 511 City Natl. Bank Bldg., Centralia, archt.

Ind., Indianapolis—July 15, by Bd. School Comrs., A. B. Good, bus. dir., addition, alterations, auditorium for School 49, 1902 West Morris St.; addition to School 85, 330 South Arlington Ave. $165,000. Bishop, Knowlton & Carson, 312 North Meridian St., archt., C. R. Ammerman, 925 Continental Bank Bldg., mechanical engr.

Me., Hinckley—July 12, by Goodwill Home Assn., S. W. Hinkley, in charge, and Crowell & Lancaster, archts., Eastern Trust Bldg., Bangor, 2 story, basement, 50 x 145 ft., brick, steel high school, plain found. $150,000 or more. Noted May 29.

Mass., Abington—Town, J. Shanahan, chn. Bd. Selectmen, taking bids altering and constructing 2 story, basement, brick, stone high school addition, plain found. $150,000.

Mass., Belmont—Town, R. T. Braderick, chn. Building Com., altering and constructing brick, steel school addition, Sycamore and White Sts., to J. S. Greenwood, Inc., 260 Tremont St., Boston, $176,995. Noted June 12.

Mass., Marlboro—City, A. A. Martel, chn. school comn., bids about July 14, 2 story, basement, 60 x 140 ft., brick, Bigelow St. plain found., Ward Park. $150,000. M. A. Dyer, 1 Beacon St., Boston, archt. Noted May 22.

Mich., Detroit—July 14, by C. A. Gadd, bus. mgr., Bd. Educ., 2 story, basement, brick, rein.-con., steel, plain found., Pershing High School Site. $150,000. Smith, Hinchman & Grylls, 800 Marquette Bldg., archts. Noted Apr. 3.

Mich., Grand Rapids—July 21, by H. Morrel, mgr. Bd. Educ., 3 story, basement, 70 x 177 ft., brick, rein.-con. addition, Ottawa Hills High School, Iroquois Dr. $200,000. H. Turner, 919 Michigan Trust Bldg., archt. W. Bradfield, 902 Michigan Trust Bldg., engr. Noted Apr. 3.

Minn., Granite Falls—July 8, by Bd. Educ., J. C. Woolstad, clk., 2 story, basement, brick, rein.-con., stone school. $200,000. Jacobson & Jacobson, 212 Wesley Temple Bldg., Minneapolis, archts. Noted May 22 under "Bids Asked."

Mo., Clayton—July 15, by Bd. Educ., c/o J. L. Bracken, supt., 7500 Maryland Ave., 2 story, basement, rein.-con., brick, Maryland and Jackson Aves. $210,000. W. B. Ittner, Inc., Continental Life Bldg., St. Louis, archts. Noted May 22.

N. H., Nashua — St. Louis De Gonzague Parish, C. S. Lacroix, pastor, taking bids 1 and 2 story, basement, brick, stone school, church, plain founds. $150,000 or more. W. E. Provost, 1061 Elm St., Manchester, archt. Noted Mar. 20.

N. J., Elizabeth—July 17, by School Bd., P. S. 21, 2 story, Shelly Ave. $336,000. H. B. Brady, Inc., 333 North Broad St., archts. Noted June 19.

N. J., Kearny (sta. Arlington) — Myers & Shanley, archts., 24 Walnut St., bids about July 15, general contract 2 story, basement, brick, steel, rein.-con. high school Chestnut St., for St. Cecelias Roman Catholic Church, J. Preston, pastor, Kearny Ave. $150,000. Noted July 3.

N. J., Perth Amboy — Bd. Educ., 261 State St., bids about Aug. 1, general contract altering and constructing 3 story, basement, brick, steel, rein.-con. addition, Madison Ave. $150,000. Greisen & Tuzig, 175 Smith St., Perth Amboy, archts. Noted June 27.

N. J., Ridgefield—Bd. Educ., A. L. Dallery, dist. clk., School 2, bids about Aug. 1, general contract 2 story, basement school. $150,000. J. N. Pierson & Son, 198 Jefferson St., Perth Amboy, archts. Noted June 12.

N. Y., Buffalo—Bd. Educ. bids about July 16, general contract School 64, incl. gymnasium, cafeteria, Amherst and North Lincoln Blvds. $438,000. D. McNeill, Dun Bldg., archt.

N. Y., Buffalo — St. John Kanty Church, Swineburn St., bids about July 15, general contract 3 story lyceum gymnasium, locker rooms, Swineburn near Brownell Sts. $250,000. J. Zabrzewski & Son, 342 Walden Ave., archt.

O., Akron—July 25, by Bd. Educ., I. M. Moses, clk., 3 story, basement, brick, steel, concrete, Tallmadge Rd. $500,000. M. M. Konarski, Central High School Bldg., archt.

O., Toledo—July 18, at office E. Hochstetter, clk. Bd. Educ., Washington Twp. Rural School Dist., 4815 298th St., school, Clover Lane and Wrenwood Rd. Langdon, Hohly & Gram, Security Bank Bldg., archts. and engrs.

CONTRACTS AWARDED

Conn., Meriden—City, C. C. Thompson, supt. schools, 2 story, 60 x 250 ft., and 50 x 50 ft., brick, steel trade school, Pleasant St., to M. A. Michaels, Bradley Ave., $100,650. Noted June 12.

Conn., Meriden—City, Bd. Educ., City Hall, 3 story, basement, brick trade school, plain found., Miller St., to M. A. Michaels, Bradley Ave., $100,650; heating and plumbing to J. T. Kay Co., State St., $31,450. Noted June 12.

Ind., Bedford—School Comrs., general contract 128 x 130 ft., brick, steel school, to D. E. Cornelius, 1915 Washington Ave. Est. $150,000. Noted May 8.

Ind., East Chicago — St. Patrick Catholic Church, general contract brick, steel school, 138th St. and Grand Blvd., to P. Maginsky, 3717 Mason St. Est. $150,000. Noted June 12.

Ind., Greencastle—De Pauw University, general contract brick, steel maintenance building on campus, to L. Colvin, Continental Bank Bldg., Indianapolis. Est. $150,000.

Ind., Indianapolis — School Comrs., general contract 2 story, basement, 74 x 148 ft., rein.-con., brick, to Service Constr. Co., 301 Cast[le] Hall, $114,600; heating and ventilating, [to] Hayes Bros., 236 West Vermont St., $24,54[3]; Plumbing, to Callon Bros., 24 South Alabama St., $14,611.

Ia., Algona—Bd. Educ., c/o Secretary, 2 story, 152 x 216 ft., rein.-con., brick, to J. H. Mayer & Co., Humboldt, $182,767; plumbing and heating, to Cuddy Plumbing & Heating Co., Mankato, Minn., $43,200. Noted June 12.

Ky., Louisville—Bd. Educ., 8th and Chestnut Sts., general contract 2 and 3 story, part basement, 250 x 400 ft., heating and ventilating, to H. Netherland & Co., 114 North 5th St., $78,862, to G. H. Rommel Co., 958 Logan St., $429,000. Noted June 5.

Md., Catonsville (br. Baltimore)—Smith & May, archts., Baltimore Trust Bldg., Baltimore, 3 story, basement, irregular shaped, concrete brick, stone high school addition, to North Eastern Contg. Co., 6 West Madison St., Baltimore, for Bd. Educ. Baltimore Co. $175,000.

Mass., Dedham — Town, School Building Comn., 2 story, basement, brick, plain found., to I. P. Rocheford, 29 Arch St., Framingham, est. $160,000; heating, to J. S. Cassedy, 133 Austin St., Cambridge, est. $25,000. Noted June 12.

Mass., Springfield — City, Superintendent Schools, and E. C. and G. C. Gardner, archts., 33 Lyman St., altering and constructing 2 story, basement, 47 x 151 ft., brick, concrete, steel addition, plain found., to E. J. Pinney, Inc., 220 Dwight St. Est. $150,000. Noted May 22.

Mo., New Madrid—Bd. Educ., c/o J. Sterns, secy., general contract 2 story, basement, 50 x 52 x 68 x 135 ft., brick, concrete high school, and rebuilding 3 story, basement school damaged by fire, to J. A. Sutterfield, Caruthersville, Mo.; plumbing, to L. T. Davey, Sikeston; heating, to J. Kitchen, Poplar Bluff; electric wiring, to United Electric Co., Cape Girardeau. Noted May 29.

Mo., Perryville—St. Mary's Seminary, Vincentian Fathers, general contract 4 story, 75 x 200 ft., rein.-con., brick, stone dormitory, to Gillespie & Daly, International Bldg., St. Louis. Est. $200,000. Noted June 27.

N. J., Princton—V. J. Eck, archt., Zobel Bldg., Red Bank, general contract 2 story, basement, brick, steel school, to Dempsey & Hardy, 16 Harrison St., Princeton, for St. Pauls Roman Catholic Church, P. J. Clune, pastor. $150,000. Noted June 19.

N. Y., Glens Falls—St. Mary's Roman Catholic Church, 2 story, basement, brick school, to Duplex Constr. Co., Glens Falls. Est. $150,000. Noted June 12.

O., Akron—Bd. Educ., general contract John R. Buchtel High School, to Higley Constr. Co., 714 North Main St., $325,710; electric wiring, to Carle Electric Constr. Co., Ohio Bldg., $23,915. Noted June 27 Daily.

O., Cleveland Heights (br. Cleveland)—Bd. Educ., W. G. Nesbit, dir., 1749 Lee Rd., Cleveland, 2 story, basement, 60 x 160 ft., brick, steel, concrete high school addition, to Charles Peterson Constr. Co., 4500 Euclid Ave., Cleveland, $144,800. Noted June 5.

O., Marysville—Bd. Educ., 584 East Broad St., 2 story, basement, 80 x 203 ft., to C. R. Chappelear, Columbus, $90,000. Noted June 12.

W. Va., Morgantown — State Bd. Control, Charleston, University High School, to R. Mankin Co., Huntington, $193,780. Noted May 8.

Wis., Wausau—St. James Catholic Congregation, 2 story, basement, 88 x 111 ft., brick, tile, to Schaefer & Olson, Chippewa Falls.

Ont., Windsor—D. Gouard, secy. Bd. Educ., general contract 2 story, basement, irregular shaped, brick, to Wilson Muxlow Co., Bartlett Bldg., est. $400,000. Contractor sublet heating, plumbing and ventilating, to Drake Avery Co., Pitt St., $70,835. Noted April 3.

THEATRES

BIDS ASKED

N. J., Perth Amboy—J. Eberson, archt., 370 Lexington Ave., New York, bids about Aug. 1, general contract 2 story, basement, 105 x 260 ft., brick, steel, rein.-con., plain found., Maple and Smith Sts., for Warner Bros. Pictures, Inc., H. M. Warner, pres., 321 West 44th St., New York. Est. $1,000,000. Noted July 3.

N. Y., New York—Seven Hundred Fifty-Five 7th Avenue Corp., 755 7th Ave., bids about July 15, general contract theatre, 50th St. and 7th Ave. $1,000,000. G. Keister, 56 West 45th St., archt. Earl Carroll Theatre, 577 7th Ave., lessee. Noted July 3.

CONTRACTS AWARDED

Kan., Salina—Midland Circuit of Theatres, 610 Midland Bldg., Kansas City, Mo., 2 story, basement, 120 x 125 ft., rein.-con., brick, steel, terra cotta, 1,500 seating capacity, incl. office, to Busboon Bros., Fairbury, Neb. Est. $400,000. Noted June 26.

Wis., Milwaukee — Warner Bros., 321 West 44th St., concrete and masonry contract theatre and office building, to S. M. Siesel Co., 160 Ogden Ave. Noted July 3 under "Contracts Awarded."

BANKS

PROPOSED WORK

Me., Bangor—Eastern Trust & Banking Co., H. A. Littlefield, pres., soon lets contract 2 story, basement, brick, concrete, steel, plain found. $150,000. Hutchins & French, 11 Beacon St., Boston, Mass., archts. Noted June 26.

Mass., Lowell—Appleton Natl. Bank, 174 Central St., soon lets contract altering and constructing 1 and 2 story, basement, brick, stone, concrete, steel addition, congrete found., Central St. $150,000. J. W. Beal Sons Co., 185 Devonshire St., Boston. Noted July 3.

N. H., Claremont—Claremont Natl. Bank, 58 Tremont St., and Hutchins & French, archts., 11 Beacon St., Boston, Mass., soon lets contract altering and constructing 2 story, basement, brick, steel, concrete addition, plain found. $150,000. Noted May 22.

N. Y., Brooklyn — East New York Savings Bank, E. A. Richards, pres., sketches by Holmes & Winslow, 153 West 38th St., New York, altering bank, Atlantic and Pennsylvania Aves. $150,000.

N. J., South Orange—South Orange Trust Co., 53 South Orange Ave., plans by Myers & Shanley, 24 Walnut St., Newark, altering and constructing 2 story, basement, brick, steel addition, 53 South Orange St. $150,000. Noted June 26.

CONTRACTS AWARDED

Mass., Northampton — Northampton Natl. Bank, 130 Main St., altering and constructing 2 story, basement, brick, steel, concrete additions, concrete founds., to M. I. O'Connor, 696 Bridge St. Est. $150,000. Noted June 12.

N. J., Perth Amboy—J. Lowry, Inc., (contractors), 270 Madison Ave., New York, steel for bank, office, to Hinkle Iron Wks., 534 West 56th St., New York, for Tomsig Realty Co., 153 New Brunswick Ave. Est. $450,000. Noted June 12 under "Contracts Awarded."

N. Y., Ossining—First Natl. Bank, 4 story, office, Croton Ave., to Hoggson Bros., 485 5th Ave., New York. Est. $150,000. Contractor now taking bids on steel and other separate contracts.

OFFICES

PROPOSED WORK

R. I., Providence—Providence Community Fund, P. B. Simonds, c/o K. C. Richmond, archt., 10 Weybosset St., soon takes new bids 5 story, basement, brick, plain found., 120 North Main St. $150,000. Former bids rejected. Noted June 5.

BIDS ASKED

N. J., Hackensack—Owner c/o P. J. Jossier, archt., 240 Broad Ave., Palisades Park, bids about Aug. 1, general or separate contracts; 2 story, basement, 60x120 ft., brick, steel, incl. stores, showrooms, Main St. $150,000.

N. J., Jersey City—Wahlgold Realty, Inc., 22 Journal Sq., or J. T. Towland, archt., 30 Journal Sq., bids about Aug. 1, general contract 12 story, basement, 75 x 75 ft., brick, steel, rein.-con., incl. stores, Hudson Co. Blvd. and Journal Sq. $250,000. Noted June 19.

N. J., Palisades Park — Owner, c/o P. J. Jossier, archt., 240 Broad Ave., 2 story, basement, brick, steel, incl. stores, apartments, Broad Ave. $150,000.

N. Y., New York—Financial Dist. Realty Co., E. Cohen, pres., 206 Bway., bids about July 15, revised plans 23 story office, vaults, storage, stores, 101 Wall St. and 112 Front St. Schwartz & Gross, 206 Bway., archts.

N. Y., New York—See "Contracts Awarded."

N. Y., St. George—July 14, by J. Whitford, archt., 56 Bay St., 6 story, basement, brick, steel, medical arts building, 102 Central Ave., for Staten Island Medical Arts, Inc., 6 Van Duzen St., Tompkinsville. $250,000.

CONTRACTS AWARDED

Calif., Los Angeles — W. Fox, Los Angeles, 12 story, basement, 52 x 125 ft., rein.-con., steel, incl. stores, to H. M. Baruch Corp., Lincoln Bldg., $260,000. Noted June 26.

Conn., Derby—Derby Gas & Electric Co., 22 Elizabeth St., 4 story, 90 x 120 ft., brick, steel, to Chas. Smith & Sons, 101 Water St. Est. $200,000. Noted May 22.

N. J., Elizabeth—Turner Constr. Co. (contractors) 420 Lexington Ave., New York, steel for 14 story, basement, 75 x 100 ft., brick, steel office, stores, to Levering & Garrigues, 552 West 23rd St., for Hersch Bros., 207 Broad St. Est. $450,000. Noted June 19 under "Contracts Awarded."

N. Y., New York—L. E. Kleban, 1440 Bway., office, stores, 361 7th Ave., separate contracts. $70,000. Bids early in winter. E. Roth, 1440 Bway., archt.

Ont., London—Huron & Erie Mortgage Corp., M. Aylesworth, genl. mgr., 9 story, basement, 75 x 136 ft., concrete, brick, steel, stone, granite, to Piggott Constr. Co., 36 James St. S., Hamilton. Est. $1,000,000. Noted May 22.

STORES

PROPOSED WORK

N. J., Newark—W. W. Oppenheim, Inc., 657 Broad St., 1 story, 60 x 190 ft., brick, steel addition, plain found., 657-59 Broad St. $150,000. Private plans. F. W. Woolworth Co., 661 Broad St., lessee.

BIDS ASKED

N. J., Paterson—Owner, c/o E. R. Coe, archt., 136 Washington St., bids about July 15, general contract 3 story, basement, 75 x 120 ft., brick, steel stores, apartments, $150,000. Noted July 3.

CONTRACTS AWARDED

Calif., Oakland — Weeks & Day, archts., Financial Center Bldg., San Francisco, 3 story, rein.-con. department store, to C. Heyer, Mills Bldg., San Francisco, for I. Magnin Co., Grant Ave., and Geary St., San Francisco. $165,000. Noted May 8.

Calif., San Jose—Hale Bros., 5th and Market Sts., San Francisco, 3 story, basement, rein.-con. department store, 1st and San Carlos Sts., to Dinwiddie Constr. Co., Crocker Bldg., San Francisco. $425,000.

B. C., Vancouver—See "Piers and Wharves."

LOFTS

PROPOSED WORK

N. Y., New York—V. Eaton, heating engr., Cleveland, O., soon takes bids general contract printing, publishing plant, office, 147 West St., for New York Telegram, c/o Rhinelander Real Estate Co., 31 Nassau St., $1,500,000. Howell & Thomas, 3868 Carnegie Ave., Cleveland, O., archts. Noted May 29.

PUBLIC

PROPOSED WORK

Mass., Winchester—LIBRARY—Town, R. T. Hale, chn. com., plans by Kilham, Hopkins & Greeley, 9 Park St., Boston, and takes bids about July 15. 1 story, basement, stone, plain found., Mystic Valley Parkway and Washington St. $175,000. Noted May 8.

N. J., Newark—MUSEUM and ART GALLERY—New Jersey Historical Society, West Park St., revised sketches by J. H. and W. C. Ely, 605 Broad St., 3 story, basement, brick, steel, plain found., Bway. and Taylor Sts. $350,000. Noted Jan. 3, 1929.

O., Cleveland Heights (br. Cleveland)—LIBRARY—P. Library Bd., C. E. Adams, pres., Coventry Rd. and Washington Blvd., plans by Walker & Weeks, 2341 Carnegie Ave., Cleveland, 2 story, concrete, brick, steel, stone, Lee and Dellwood Rds. $200,000.

Pa., New Castle—COURT HOUSE and JAIL—Lawrence Co. court house and jail. $1,000,000 or more. W. R. Eakin, Court House, co. clk. Engineer and architect not selected.

Tex., Amarillo—COURT HOUSE and JAIL—Potter Co., c/o S. B. Motlow, judge, sketches 8 story, basement, 2 story tower, rein.-con., stone, 24,000 sq.ft. floor space. $400,000. Townes, Lightfoot & Funk, c/o Johnson Bldg., engrs. Noted May 15.

BIDS ASKED

Conn., Middletown—DORMITORIES—July 15, by State Capital, Hartford, three 2 story, brick, steel. Towner & Sellew Associates, 363 Main St., archts.

Conn., Newtown — ASYLUM — July 22, by State, Fairfield State Hospital Comn., Hartford, 10 buildings, incl. administration, dining and kitchen unit, employees home, engineers cottage, garage, fire station, carpenter and painting shops, electrical, plumbing and heating shops, laundry, store house, power house and coal bunker. $1,750,000. W. P. Crabtree, 410 Asylum St., Hartford, archt. Noted May 15.

Mass., Boston—LIBRARY—Boston Medical Library and Massachusetts Medical School, J. W.Barthol, chn. comn., Fenway, taking bids 2 story, basement, brick, stone, steel medical library addition, plain found., Fenway. $300,000. Bigelow, Wadsworth, Hubbrad & Smith, 11 Beacon St., archts.

Mass., Lynn—POLICE STATION, etc.—July 22 (extended date), by City, 1 and 2 story, basement, brick, steel, police station, garage, boiler house and heating plant, plain found. $150,000. Noted June 5.

N. J., Bayonne—LIBRARY—Bayonne Free Public Library, Avenue C, bids about Aug. 15, 2 story, basement, 160 x 160 ft., brick, steel addition, Avenue C. $150,000. C. Shilowitz, 26 Journal Sq., archt. Noted June 19.

N. J., Paterson—HALL of RECORDS, etc.—Bd. Freeholders Passaic Co., Court House, bids about Aug. 15, general contract 8 story, basement, brick, steel, rein.-con., Hall of Records and County Detention Jail, Grand St. between Spring and Jackson Sts. $1,000,000. H. B. Crosby, 1st Natl. Bank Bldg., archt. Noted June 19.

N. Y., Brooklyn—COURT HOUSE—H. Hesterberg, pres. Brooklyn Boro, Boro Hall, bids about July 15, general contract 3 story, magistrates and municipal court house, 4th Ave., 42nd and 43rd Sts. $475,000. M. D. Metcalfe, 1310 Bedford Ave., archt. Noted Apr. 10.

N. D., Bismarck—COURT HOUSE and JAIL—July 28, by A. C. Isaminger, aud., Burleigh Co., 3 story, basement, rein.-con., brick, steel court house, jail, sheriffs residence. $210,000. I. L. Bush, Minot, archt. Former bids rejected. Noted June 19.

CONTRACTS AWARDED

Conn., Wilton — TOWN HALL — Town, Bd. Selectmen, 1 story, 105 x 112 ft., brick, steel town hall, incl. school, to H. Wales Lines Co., 134 State St., Meriden. Est. $150,000.

Mass., Arlington—LIBRARY—Town, (Robbins Library), L. E. Spofford, librarian, altering and constructing 1 and 2 story, basement, brick, stone, steel addition, plain found., to J. S. Greenwood, 260 Tremont St., Boston. Est. $150,000. Noted May 22.

Mass., Foxboro—NURSES HOME, etc.—Commonwealth of Massachusetts, Dpt. Mental Diseases, State House, Boston, 2 story, basement, brick, stone nurses home and employees building, plain founds., at State Hospital, to Suffolk Constr. Co., 70 Norwell St., Dorchester, $132,200; plumbing, to Hobart & Farrell, 26 Court St., Brockton, $22,496. Noted June 19.

BUILDINGS—UNCLASSIFIED

PROPOSED WORK

Pa., Ambridge — LABORATORY — Spang Chalfant Co., Clark Bldg., Pittsburgh, soon lets contract brick, steel, Duss Ave. Private plans.

R. I., Providence—HOME—Jewish Home for Aged, J. J. Hahn, 323 Angell St., sketches by Krokyn & Browne, 120 Milk St., Boston, Mass., home for aged. $150,000.

BIDS ASKED

Mo., St. Louis—MERCHANDISING MART—Terminal Railroad Assn., 180 Market St., and St. Louis Mart, Inc., lessee, c/o H. C. Martin, 315 North 10th St., bids about Aug. 2, 13 and 16 or 18 story, basement, rein.-con., brick, steel, stone, merchandise, exposition, warehouse, offices, Spruce, 12th, 13th and Poplar Sts. $5,000,000. Private plans. W. J. Knight & Co., Wainwright Bldg., engrs.

CONTRACTS AWARDED

Ind., Lafayette — ORPHANS HOME — Bd. Comrs. Cary Orphans Home, rein.-con., brick, to A. E. Kemmer, Lafayette. Est. $150,000. Noted May 8.

Mass., Woods Hole—LABORATORY—Woods Hole Oceanographic Institution, F. Lillie, pres., Harvard University, Cambridge, 3 story, basement, 60 x 140 ft., brick, plain found., to G. B. Macomber Co., 38 Chauncy St., Boston. Est. $150,000 or more. Noted June 5.

Mo., Kansas City — MAUSOLEUM — Forest Hill Cemetery, 1 story, 42 x 212 ft. mausoleum, to C. A. Kelly, 3137 Karnes Blvd. Est. $400,000.

O., Sandusky—HOME—Fraternal Order of Eagles, 3 story, basement, brick, steel, concrete home, to A. Schnurr, 1013 West 21st St. Est. $150,000. Noted June 26.

Wis., Milwaukee — EXCHANGE — Wisconsin Telephone Co., 418 Bway., 2 story, basement, 85 x 86 ft., brick, Oklahoma St., to R. Sheridan, 450 State St. Est. $150,000. Noted June 19.

Buildings

FACTORIES AND MILLS

PROPOSED WORK

Calif., Ontario—ELECTRIC RANGE PLANT—Edison Appliance Co., sketches plant. $1,000,000, incl. equipment.

Fla., Lake Placid—PACKING HOUSE—Lake Placid Citrus Growers Assn., W. Vogt, mgr., packing house. $70,000.

Md., Baltimore—FACTORY—Owens & Sisco, Continental Bldg., archts., soon lets contract altering and constructing 3 story, basement, brick, concrete, rein.-con., structural steel addition, 1640-44 Gorsuch Ave., for Helwig & Leitch Corp., 1533 Gorsuch Ave.

Mich., Muskegon — FACTORY — Brunswick Radio Corp. (subsidiary Warner Bros. Pictures), Laketon St., L. A. Bishop, 10 story, basement, 280 x 400 ft., brick, steel. $300,000. Private plans.

Mo., St. Louis—CEMENT MANUFACTURING PLANT—St. Louis Portland Cement Co., c/o C. Boettcher, pres. Ideal Cement Co., Denver, Colo., sketches 4,000 bbl. daily capacity plant, incl. two 11 x 200 ft. kilns, mill and crusher plant, large stone quarry. $2,000,000.

N. J., Belleville (br. Newark)—FACTORY—Fletcher-Thompson, Inc., archts., 542 Fairfield Ave., Bridgeport, Conn., soon lets contract 4 story, 78 x 170 ft., brick, steel, rein.-con. addition, Schuyler Ave. and Terrace Pl., for Wallace-Tierman Products, Inc., 11 Mill St.

N. J., Bound Brook—FACTORY—Francisco & Jacobus, archts., 511 5th Ave., New York, soon lets contract 1, 2 and 3 story, 405 x 410 ft. main building, 1 and 2 story, 100 x 200 ft. manufacturing building, 100 x 100 ft. machine shop, 1 and 2 story, 130 x 220 ft. manufacturing Building 2, 1 story, 50 x 100 ft. power house, also storage building, pump house, switch house, gatehouse, scalehouse and car shed, for Bakelite Corp., 247 Park Ave., New York. $150,000 or more. Noted Mar. 27.

N. J., Paulsboro—LABORATORY—Vacuum Oil Co. soon lets contract 1 and 2 story, basement, 40 x 70 ft., brick, steel, plain found. $40,000. Private plans.

N. J., Teaneck (br. Hackensack)—PLANT—Sheffield Farms Co., Inc., 524 West 57th St., New York, soon lets contract 1 story, basement, 100 x 150 ft., brick, steel addition. $75,000. F. A. Rooke, 12 East 41st St., New York, archt. Noted July 3.

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Factories and Mills (Continued)

N. J., Union City—DAIRY PLANT—Consumers Dairy Co., 400 45th St., sketches by G. Willaredt, 411 23rd Ave., West New York, altering and constructing 2 story, basement, 30 x 155 ft., brick, steel addition, plain found., New York Ave. and 45th St. $45,000.

N. Y., Brooklyn—FACTORY—M. Dorf, 183 Floyd St., sketches by H. C. Nurick, 44 Court St., 2 story, 100 x 100 ft., Meserole Ave. and Russell St. $40,000.

N. Y., Brooklyn—PLANT—Federal Plumbing Supply, 1721 St. Marks Ave., sketches by E. M. Adelshon, 26 Court St., 3 story, 46 x 117 ft. manufacturing and storage, St. Marks and East New York Ave. $40,000.

N. Y., Brooklyn—FACTORY—Thames Trading Co., 47 Thames St., plans by M. Klein, 65 Court St., 4 story, 90 x 221 ft., vicinity of Boerum and Bogart Sts. $300,000.

N. Y., White Plains—BAKING PLANT—H. Holder, archt., 242 Franklin Ave., Brooklyn, bids after Aug. 1, general contract 60 x 260 ft. baking plant, for Dugan Bros., 290 South 5th St., Brooklyn. To exceed $150,000.

O., Cleveland — FACTORY — Cleveland Trencher Co., A. V. Jones, genl. mgr., 20100 St. Clair Ave., plans by A. Schmidt, 4500 Euclid Ave., 1 story, 60 x 90 ft., brick, steel addition. $40,000.

Pa., Greenville—PLANT—Chamber of Commerce, c/o J. Dimmick, 1 story, 60 x 150 ft., brick, steel, Mercer St. Adalet Mfg. Co., 4610 St. Clair Ave., Cleveland, O., lessee.

Pa., Phila.—LABORATORY, etc.—Midvale Co., 4300 Wissahicken Ave., 2 story, basement, 50 x 100 ft., brick, steel laboratory, office, Roberts Ave. and Blabon Pl. United Engineers & Constr. Co., 112 North Broad St., engrs.

Pa., Uniontown—SHIRT FACTORY—Michael Berkowitz Co., Inc., 170 5th Ave., New York, plans by E. R. Johnson, Fayette T. and T. Bldg., 2 story, 55 x 435 ft., 50,000 sq.ft. floor space, brick, hollow tile, steel. To exceed $40,000.

Tex., Del Rio—ICE PLANT—Central Power & Light Co., Frost Bldg., San Antonio, plans, surveys ice plant on 7 lot site Devils River Hy. west of here. $60,000. Private plans.

Wis., Milwaukee—DYE PLANT—Novelty Dye Wks., 375 Jefferson St., plans by G. Schley & Sons, 425 East Water St., 1 story, 150 x 280 ft., brick, plain found., East Capitol St.

BIDS ASKED

Mass., North Billerica—MILL—July 14, by C. T. Main, Inc., engrs., 201 Devonshire St., Boston, 1 story, brick, 70 x 220 ft. finishing building for mill, for Talbot Mills, F. S. Clark, pres. $100,000.

Neb., Omaha — PLANT — Quaker Petroleum Co., 14th and Nicholas Sts., bids about Aug. 1, general contract 56 x 210 ft. and 69 x 96 ft. oil compounding and barrel plant, brick, concrete, 20th and Hickory Sts.

N. J., Harrison—FACTORY—Driver-Harris Co., Middlesex St., or J. A. Finegan, archt., 776 Broad St., Newark, bids about Aug. 1, general contract 1 and 2 story, basement, rein.-con. addition. $250,000. Noted June 5.

N. J., Roselle Park—FACTORY—Poggi & Bragdon, archts., 275 Morris Ave., Elizabeth, taking bids 2 story, basement, brick, steel, plain found., Franklin Pl., for Fusco Bros., c/o architects. $40,000.

N. J., Sewaren—COMPOUNDING and TANK ROOMS, etc.—H. S. Bell, engr. and archt., 233 Bway., New York, taking bids general contract 5 and 6 story, basement, 180 x 430 ft., brick, steel, rein.-con. compounding and tanks rooms, boiler house and power unit additions for Shell Eastern Petroleum Products Co., 122 East 42nd St., New York. $150,000. Noted June 19.

N. Y., Buffalo — INDUSTRIAL — J. H. Williams & Co., 400 Vulcan St., taking bids brick addition. $50,000. W. C. Kress, c/o owner, plant engr.

O., Portsmouth—July 16, by Ohio Power Co., Offnell St., 40 x 60 ft., brick, concrete, steel substation, 50 ft. high, Millbrook Park. $50,-000. Private plans.

Tex., Brownsville — PLANT — Texas Citrus Fruit Growers Assn., c/o J. H. Shary, pres., San Benito, taking bids 2 story, brick, concrete canning and packing plant. $70,000. Private plans.

Tex., Harlingen—PLANT—Texas Citrus Fruit Growers Assn., c/o J. H. Shary, pres., taking bids 2 story, rein.-con., brick, tile packing and canning plant. $100,000. Private plans.

CONTRACTS AWARDED

Ark., Norphlet—OIL REFINERY—MacMillan Petroleum Corp., El Dorado, Ark., and 530 West 6th St., Los Angeles, Calif., brick, concrete oil refinery, owner builds, under supervision of C. C. Benz, assistant supt. mfg.; concrete work awarded to Peters & Cramer, El Dorado; brick work, to Rau Constr. Co., 1815 Harrison St., Kansas City, Mo.; two 310 hp. Heinie Cross Drum Box header 160 lb. pressure, to Continental Supply Co., 1501 Locust St., St. Louis, Mo.; 150 fire brick and 40 tons Sairset cement, to A. P. Green Fire Brick Co., Mexico, Mo.; 60 tons structural steel, to Mississippi Valley Structural Steel Co., 3117 Big Bend Rd., Maplewood, Mo.; 11 tons castings, to El Dorado Fdry. & Machine Co., El Dorado; 23 centrifugal pumps, to Byron-Jackson Pump Co., 2150 East Slawson Ave., Los Angeles, Calif.; steam pumps, to Union Steam Pump Co., Battle Creek, Mich.; 5,000 sq.ft. condensers and exchangers, to Southwestern Eng. Corp., Higgleworth St., Los Angeles, Calif.; 18 x 115 ft. 44 ft. high Fluor cooling towers and 20,000 ft. 1 in. toncan iron seamless tubing, to National Supply Co., 147 N. L. A., Los Angeles, Calif.; welded pipe fittings, to Tube-Turns, Inc., Louisville, Ky.; fabricated pipe, vanstone nipples, forged steel hub and flanges, to Midwest Piping & Supply Co., Inc., 1450 South 2nd St., St. Louis, Mo.; 34 tanks, to American Tank Co., Oklahoma City, Okla.; 20,000 lin.ft. 1 in. steel fusion welded tubes, to Republic Steel Corp. Est. $250,000.

Calif., Emeryville — ASSEMBLY PLANT — Amer. Tractor Co., 90 x 100 ft. assembly plant, to Austin Co., 16112 Euclid Ave., Cleveland, O. Est. exceeds $40,000.

Calif., Pittsburg — PLANT — Shell Chemical Co. (subsidiary of Shell Oil Co.), Shell Bldg., San Francisco (1st unit), fireproof plant on 613 acre site, to G. Wagner, Inc., 181 South Park St., San Francisco. Total est. $5,000,000.

Ind., Indianapolis—DAIRY PLANT—W. H. Roberts, general contract brick, steel, Millersville Rd., to A. A. Smock, 3725 North Delaware St. Est .$44,000.

Ind., Marion—FACTORY—Silent Alarm Co., rein.-con., brick, steel East Charles St. $41,-000. Owner builds. Private plans.

Ind., Muncie—FACTORY—Warner Gear Co., 2 story, 300 x 400 ft., incl. power plant, machine shop, 67 mi. west of here, private contract. Work starting at once. Est. $500,000.

Kan., Kansas City—FACTORY—Colgate Palmolive Peet Co., 919 North Michigan Ave., Chicago, Ill., 25 x 25 ft. steel tower, 135 ft. high, to Kansas City Structural Steel Co., 21st St. and Metropolitan Ave., Kansas City, Mo. Est. $100,000.

Kan., Wichita — FACTORY — Stearman Aircraft Corp., L. Stearman, pres., 601 East 35th St., factory buildings, incl. 2 story, concrete, brick, stone administration building, 1 story, concrete brick, steel garage, warehouse, concrete, brick steel boiler and power plant, gate house, South Hillside Rd., to Austin Co., 16112 Euclid Ave., Cleveland, O. Est. $1,000,000.

Mass., Dorchester (sta. Boston)—FACTORY—Albree Marble & Tile Co., Inc., 9 Ashland St., 1 story, 100 x 100 ft., brick, steel, plain found., Mt. Vernon St. and Columbia Rd., to I. H. Bogart Co., 60 State St., Boston. Est. $50,000. Noted June 5.

N. J., Hillsdale—LAUNDRY and SERVICE—Dpt. Institutions & Agencies, State Office Bldg., Trenton, general contract 1 story, basement, 85 x 100 ft. and 100 x 150 ft., brick, steel, plain found., at New Jersey State Hospital Grounds, to Karno Smith Constr. Co., Broad St. Bank Bldg., Trenton, $279,500. Noted June 12.

N. Y., Buffalo—INDUSTRIAL—Ford Motor Co., 3674 Schaefer Rd., Dearborn, Mich., piling foundations, sand fill 45 x 1,000 ft. dock, and 400 x 650 ft. industrial building, to Great Lakes Co., Morgan Bldg. Est. $500,000.

N. Y., Endicott—MANUFACTURING—International Business Machine Corp., remodeling building, to A. W. Bowie, Press Bldg., Binghamton. Est. $40,000. Noted June 27.

O., Westerville—SHOPS, etc.—Kilgore Mfg. Co., Westerville, 60 x 100 ft. machine shop, and 100 x 100 ft. warehouse addition, brick, steel, concrete, to R. O. Karg, Westerville. $55,000.

Oregon and Washington — DISTRIBUTING STATIONS—Gilmore Oil Co., Ltd., 2423 East 28th St., Los Angeles, Calif., 9 branch distributing stations, each to have storage warehouse, garage, loading rack, gas tank and pump house at Albany, Roseburg, Eugene, Medford, and Portland, Ore., Centralia, Bellingham, Everett, Wash., and one place not selected, to Austin Co., Porter Bldg., Portland, Ore.

B. C., Vancouver—ICE PLANT—See "Piers and Wharves."

Que., Montreal — COPPER REFINERY — Canadian Copper Refineries Ltd., subsidiary Nichols Copper Co., Washington St., Long Island City, N. Y., excavation for refinery, to Kendall Bros., 1853 Iberville St.; steel, to Canadian Vickers Ltd., Maisonveuve. Est. $200,000 Noted Apr. 24.

GARAGES

PROPOSED WORK

Ia., Waterloo—J. A. Paulsen, dist. engr. State Hy. Comn., 603 Marsh-Place Bldg., soon lets contract 34 x 110 ft. tile maintenance garage.

N. Y., Brooklyn—C. Strang, 356 Coney Island Ave., sketches by E. M. Adelsohn, 26 Court St., service garage, Coney Island Ave. and Caton Pl. $50,000.

N. Y., Long Island City—Woodhaven Liberty Realty Co., 565 5th Ave., Brooklyn, bids about December, general and separate contracts 2 story, 115 x 166 ft. service garage, Rockaway Blvd. and 93rd St. $50,000. Private plans. Noted June 27.

BIDS ASKED

Conn., Bridgeport—Adley Co., Inc., 947 State St., taking bids 1 and 2 story, 65 x 95 ft., brick, steel, cast stone service garage and sales addition. $40,000. H. Koerner, 83 Fairfield Ave., archt.

Ia., Algona—July 15, at office Auditor Kossuth Co., 34 x 96 ft. maintenance garage.

Mo., Jefferson City—July 21, by State Hy. Comn., c/o T. H. Cutler, ch. engr., 3 story, rein.-con., brick headquarters garage, record storage building.

CONTRACTS AWARDED

Conn., Westport—A. S. Uhler, c/o D. P. Hart, archt., 19 West 44th St., New York, service garage, to M. A. Durrschmidt, 100 Main St., Derby. Est. exceeds $40,000.

Kan., Wichita—See "Factories and Mills."

Mass., West Springfield (br. Springfield)—General Motors Trucks Co., 781 Worthington St., Springfield, 2 and 3 story, 125 x 175 ft. brick, steel sales and truck service garage, to Fred T. Ley & Co., Inc., 220 Dwight St., Springfield. Est. $125,000. Noted May 15.

R. I., Providence — Nat. Service Building Trust, 79 Milk St., Boston, Mass., 1 and 2 story, 135 x 230 ft., brick, rein.-con. service garage and service station, plain found., 459 Promenade St., to Capobianco Constr. Co., 44 School St., Boston, Mass. Est. $125,000 or more.

POWER PLANTS

PROPOSED WORK

Ia., Nevada—Iowa Railway & Power Co. soon takes bids power plant. $200,000.

Md., College Park—University of Maryland, College Park, plans by Smith & May, Calvert Bldg., Baltimore, concrete, brick central heating plant. $200,000. H. Massart, 324 North Charles St., Baltimore, engr.

Mass., Lawrence — Meadow Brook Laundry Co., 17 North Methuen St., soon lets contract on revised plans 1 story, brick, steel power house, plain found. $40,000, incl. equipment. Former bids rejected. H. Petzold, Bay State Bldg., archt. Noted June 26.

Wash., Seattle—Bd. P. Wks., rejected bids May 31, furnishing three 4,000 kva. transformers and four 37,000 volt oil circuit breakers for municipal lighting department. Will readvertise.

BIDS ASKED

Ind., Hammond—July 16, by Graham, Anderson, Probst & White, 80 East Jackson Blvd., Chicago, Ill., electric generating station 32 ft. elevation, incl. boiler room, turbine room, shop, for 194 x 380 ft. concrete, brick, steel addition to State Line Generating Co.

CONTRACTS AWARDED

Kan., Wichita—See "Factories and Mills."

SHOPS AND FOUNDRIES

CONTRACTS AWARDED

Wis., Cedar Grove — FOUNDRY — R. J. Schwab & Sons Co., Cedar Grove, 1 story, 100 x 175 ft. addition, to Worden-Allen Co., Port Washington Rd., Milwaukee; roofing, to Johns-Manville Co., 165 West Water St., Milwaukee; steel sash, to Federal Steel Sash Co., 228 3rd St., Milwaukee; plumbing, to Cedar Grove Hardware Co.; masonry, to Cedar Grove Block Co.

WAREHOUSES

PROPOSED WORK

N. Y., Syracuse—Pierce, Butler & Pierce, 41 East 42nd St., New York, soon takes bids general contract repairing fire damage and replacing warehouse. $100,000. Private plans.

N. Y., West Brighton (mail Staten Island)—W. P. Gross, Tanner & Co., Bank St., St. George, sketches by R. G. Cory, 30 Church St., New York, 7 story, basement, brick, steel, rein.-con., plain found. $150,000.

Pa., Pittsburgh—July 10, by Lake & Davidson, archts., Negley Bldg., 2 story, 70 x 100 ft., brick, steel, Forbes St. and McDevitt Pl., for Jewel Tea Co., 917 Irwin Ave.

BIDS ASKED

O., Cincinnati—See "Contracts Awarded."

Pa., Pittsburgh—See "Contracts Awarded."

CONTRACTS AWARDED

Calif., Richmond—Parr-Richmond Terminal Corp., warehouse, oil distributing terminal, storage tanks, loading racks, to F. C. Stolte, 10 Glen Alpine Rd., Oakland, $100,000.

O., Cincinnati—Ferro Concrete Realty & Eng. Co., 3rd and Elm Sts., 3 story, 105 x 399 ft. warehouse and manufacturing building, day labor and separate contracts (separate contracts awarded). $600,000. Atlantic & Pacific stores, 420 Lexington Ave., New York, lessee. Noted June 19 under New York "Buildings—Unclassified."

Pa., Phila. — Pennsylvania Warehousing & Safe Deposit Co., 113 South 3rd St., 7 story warehouse, to Turner Constr. Co., 1700 Walnut St., Phila., and Graybar Bldg., New York. Est. $200,000. Contractor now taking separate contract bids.

Pa., Pittsburgh—Frank L. Smith Constr. Co., Dayton, O., 2 story, 158 x 252 ft. warehouse, day labor and separate contracts. To exceed $200,000. Great Atlantic & Pacific Stores, 420 Lexington Ave., New York, lessee.

Que., Montreal—Montreal Warehousing Co., 234 Wellington St., general contract warehouse, Grey Nuns St., to Atlas Constr. Co. Ltd., 679 Belmont St. Excav. work under way. Est. $350,000.

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